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Development of Knowledge Management Process to Enable Incident Management

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Preface

It has been a long but rewarding journey. It has taught me a lot, how to overcome challenges and manage time efficiently, and have patience to carry on in difficult times.

I would like to express my gratitude to my instructor Dr Marjatta Huhta and also Zinaida Grabovskaia, PhL for their priceless input, guidance and assistance. Additionally, I would like to thank my colleagues Ilona and Jose who have provided me with their support and guidance.

Finally, I thank God for giving my strength to achieve this goal, and my family: my dear husband, little daughter, and my Mother for their continuous encouragement and patience.

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Natalia Minina

Metropolia

Abstract

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This Thesis focuses on development of Knowledge Management in the case company in order to affect its Incident Management. A unit within case company (AMU) is responsible for monitoring and solving ITSM tickets related to various applications (Incident Management process of ITIL); it is also responsible for creating and maintaining applications knowledge (Knowledge Management process of ITIL). Surveys conducted within the unit have revealed that there are certain gaps in the current Knowledge Management process and if improved, Incident Management can benefit from it by having shorter ITSM ticket resolution times and even tickets deflection can happen.

This Thesis uses qualitative research methodology and action research as its main research approach. The theoretical part includes the review of available knowledge on Knowledge Management and best practices of IT Service Management, such as ITIL. The data are gathered from four surveys and two pilots conducted in the case company, based on which the initial version of the improvement proposal is produced. Later on the proposal is verified with the company experts and the final version of the proposal is produced according to their feedback.

The outcome of this Research is a proposal for an improved Knowledge Management process for the case company AMU unit. The improved process aims at enabling more efficient Incident Management process by shortening times for ITSM ticket resolution and deflecting tickets when possible.

Key words	Knowledge Management, Incident Management, Knowledge Sharing, Knowledge Centered Support, ITIL

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LIST OF ACRONYMS

AMO	Application Management Owner
AMU	Application Management Unit
APAC	Asia-Pacific
EMEA	Europe, Middle East and Africa
FTS	Follow-the-sun support model
ITIL®	Information Technology Infrastructure Library
ITSM	IT Service Management
ITSM IM	ITSM Incident Management
ITSM KM	ITSM Knowledge Management
KCS	Knowledge-Centered Support
KM	Knowledge Management
ROI	Return On Investment
SLA	Service Level Agreement
SLR	Service Level Requirement
SLT	Service Level Target
SKMS	Service Knowledge Management System

1 Introduction

This Thesis focuses on improving the Knowledge Management process to influence Incident Management in the case company unit. This study is based on the users' feedback, interviews, workshops and pilots conducted in the case company. As its outcome, the study suggests recommendations for enabling more efficient Knowledge Management which, in its turn, can lead to more efficient Incident Management.

1.1 Case Company Background

The case company of this study is a Finnish stock-listed company, one of the world's leading companies in wireless communications. The company has subsidiaries (offices) in many foreign countries and enjoys considerable international presence.

Currently, the case company's organizational structure consists of multiple units, including *the Application Management Unit (AMU)* which is responsible for monitoring and solving ITSM tickets related to various applications. The unit responsibilities also include responding to business requests and providing applications-related trainings. The number of applications under the AMU supervision varies according to the needs of the company; at the moment of conducting this research, the number of applications was around 200. The majority of the AMU employees are support specialists responsible for solving IT Service Management (ITSM) incidents and service requests by resolving the tickets created by Level-1 of applications support in the AMU scope. The unit is responsible primarily for Level-2 support, and, in some cases, Level-3 support as well. While these responsibilities fall into the realm of *Incident Management*, creating and maintaining applications knowledge relates to *Knowledge Management*, according to the popular ITIL-based classification (ITIL 2007). Therefore, this study concentrates on two company processes - mainly on *Knowledge Management* and also, to some extent, on *Incident Management.*

1.2 Organizational Challenge

The current challenge for the case company AMU unit is the effective use of the available ISTM Knowledge Management which capability is currently not used sufficiently. Some improvements are needed for more effective new knowledge creation and maintenance of the existing one by the AMU support specialists, especially in relation to Incident Management. The reasons for this current insufficiency are several.

The first reason for Knowledge Management lacking efficiency is that prior 2009 there was no dedicated tool for maintaining applications knowledge. The current working tool of the application support AMU specialists is *the ITSM suite* which was deployed in 2009. Prior to that, the case company used a Request Management Tool for Incident Management provided by the vendor, Remedy Corporation. However, the problem with that tool was that it did not include Knowledge Management process; therefore, the AMU applications-related knowledge was spread across different tools and could not be utilized effectively.

The second reason for lack of efficiency is that, even after the introduction of the tool for Knowledge Management in 2009, a considerable proportion of application support specialists are still not using ITSM Knowledge Management on a regular basis. In April 2010, in order to identify the current utilizations of ITSM Knowledge Management and its development needs, the AMU Knowledge Management core team organized the first KM-related survey among the AMU employees. This survey discovered that a considerable portion of respondents who were application support specialists were not using ITSM Knowledge Management on a regular basis and had limited experience in it in general. As a result, these existing limitations, among other challenges, reduce the AMU team's efficiency in resolving applications-related ITSM incidents.

Thus, the challenge for the case company's AMU is the inefficient use of the currently available ISTM Knowledge Management functionality for knowledge creation and maintenance. This lack is experienced by the AMU application support specialists. As a consequence of not using this available functionality, it makes an impact on the efficiency of the case company Incident Management process manifested in slow tickets resolution as well as Knowledge articles (solutions constituting "the knowledge") being unavailable in the Knowledge Base and Self-service. This, in turn, has impact on possible deflection of tickets. If improved, the Knowledge Management process in the case company can lead to better efficiency of the AMU employees in Incident Management.

1.3 Research Question and Structure of This Study

The purpose of this study is to find the means to develop Knowledge Management process in AMU to enable faster Incident Management. This can benefit a shorter ITSM tickets resolution and deflection of some tickets, among other improvements. To achieve this research objective, the study aims to reply to the following research question:

How to develop the Knowledge Management process in the case company to enable Incident Management?

To answer this research question, the study, first, analyzes the data collected in three surveys in the case company, paying particular attention to the analysis of the open comments focusing directly or indirectly on the Incident Management process. These comments are categorized and the most critical of them, from the Incident Management point of view, chosen for further scrutiny. Based on the obtained knowledge, the study investigates the problematic of Knowledge Management and its possible effects on improving Incident Management. Additionally, results of two pilots conducted during this study are analyzed, from the perspective of effectiveness of the Incident Management process. During the pilots, AMU created its own interpretation of KM Maturity Model, originally produced by APQC, in order to evaluate the current status and needs for improvement in the KM process.

After that, based on the existing KM theory and IT industry best practices, a proposal is developed how to improve the most critical issues of the current Knowledge Management process in the case company unit with the purpose to shorten the time for ITMS ticket resolution and enable ticket deflection as much as possible.

This Thesis is written in seven sections. Section 1, Introduction, gives an overview of the case company background and research problem. Section 2 discusses the methods and material used in the study. Section 3 overviews the results of the current state analysis. Section 4 analyzes the existing KM-related theory and best practice. Section 5 develops an initial proposal. Section 6 presents the results of the validation of the initial proposal with the case company experts. Finally, Section 7 presents the final proposal after the corrections following the validation interviews.

2 Method and Material

This section overviews the research approach and data collection and analysis methods used in this Thesis. This Thesis applies action research as its research approach because this study is conducted in the context of the researcher's organization, aims at making improvements, and applies actions in cycles, along with continuing the research process. This section describes the research approach, data collection and analysis used in this study.

2.1 Research Approach

This Thesis utilizes action research approach as its main research approach. Blichfeldt and Andersen (2006) suggest using action research, among other research methods, for studying changes and their effects. Action research is said to be especially suitable to investigate changes in social context, and especially, among other areas, in organizational development (Blichfeldt and Andersen 2006: 3). In this study, the researcher acts as an agent implementing the change.

Coghlan and Brannick (2005) define action research as a cyclic process for systematical tackling a problem, consisting of four phases: *Diagnostics, Planning action, Taking action* and *Evaluating action.* In this study, these four basic steps were transformed into nine action research steps illustrated in Figure 1 below.

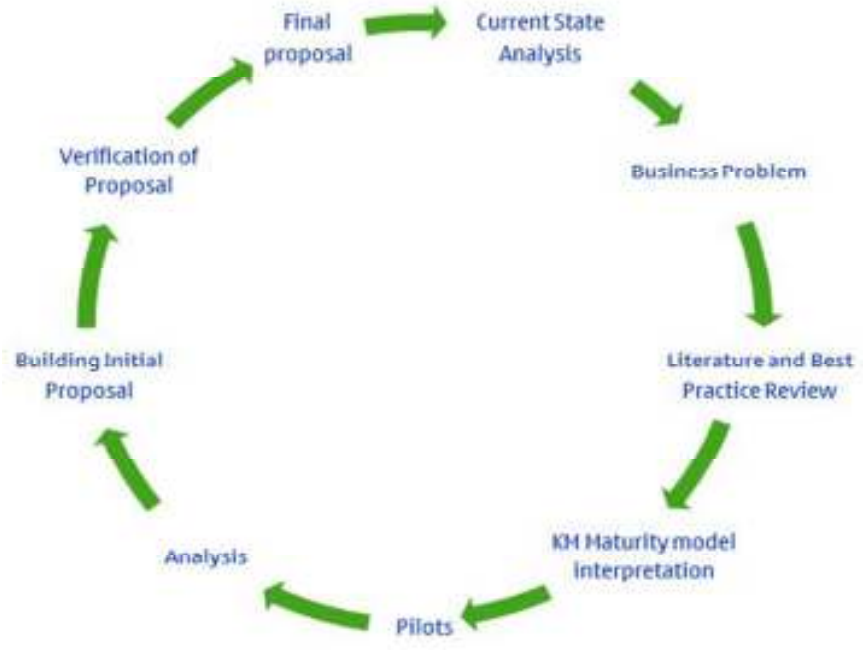

Figure 1. Action research cycle conducted in this study.

As demonstrated in Figure 1, the action research cycle implemented in this study consists of nine steps following each other. The first step is the current state analysis which includes analysis of Survey 1-3 data, informal interview of an AMU KM core team member and case company materials. Additionally, Survey 4 was conducted to verify the current state of KM. The second step was the production of the CC KM Maturity Model which was later used during the next step of the cycle called Pilots. The next step was the analysis of all the data (Surveys 1-3, Survey 4, Pilots 1-2) for the purpose of production of the initial proposal. Finally, the proposal was verified with company experts and the final proposal is produced according to their comments.

Thus, this study draws from several sources of knowledge and research data. The theoretical framework is grounded in the literature review and the analysis of the industry best practices related to Knowledge and Incident Management, as well as IT Service Management methodologies such as ITIL and KCS. Additionally, some factors stimulating and influencing knowledge creation and sharing are explored, as part of the theoretical background.

The outcome of this study is a proposal for an improved Knowledge Management process in the case company unit (AMU), in terms of the shorter ticket resolution times and possible tickets deflection. This proposal is then validated in the interviews with the case company experts and corrected to formulate a final proposal. All the data sources are overviewed in the subsequent section.

2.2 Surveys and Interviews in This Study

There are various techniques for conducting qualitative research. In this study, surveys and interviews are utilized as the main qualitative research methods to gain insight into the research problem.

Despite multiple other qualitative research methods available, the interview remains one of the most popular forms of data gathering for qualitative research studies. The target of conducting interviews is to get in-depth information about a topic based on views and experiences of interview participants. There are typically three types of interviews types distinguished in conducting interviews: *informal conversational interview, general interview guide approach and standardized open-ended interview*. (Turner 2010: 754-759).

This research utilizes *a standardized open-ended interview* where (Patton 2002: 344-347) questions posed to the interviewees are identical, but the responses to the questions are open-ended, which gives participants a possibility to provide as detailed answer as they want to. The weakness of the standardized open-ended interview is the difficulty in coding data (Turner

2010: 756). Once the data from the interview(s) are gathered, they need to be interpreted correctly, understood and compiled into the groups of findings consistent with what the interviewees said.

Survey as a Qualitative Research Method

A survey is defined as collecting information via different methods from individuals on themselves or on the social units they belong to. Survey researches can be distinguished as *exploratory*, *confirmatory* and *descriptive* once. (Forza 2002: 155)

In this study, exploratory type of survey research has been used because its purpose is to gain understanding of the real processes utilized by its users. Open comments in the analyzed surveys are particularly important, from the Knowledge Management process utilization point of view, because on contrary to the rest of Surveys questions (which are of pre-defined answers-type), they provide a possibility to hear about the insights and concerns related to process from its participants.

In this study, improvement ideas from the support specialists provided in surveys are valuable for two reasons. The first reason is that they resolve ITSM tickets on a daily basis which gives them understanding about ITSM KM knowledge needs, i.e. what is missing from the knowledge management point of view (to be created) and gaps in the existing ITSM KM knowledge base (to be maintained); if these knowledge needs are not fulfilled will be resulting in new ITSM tickets. The second reason is the specialists are in contact with applications' Key Users who, in turn, know applications' End Users knowledge needs which helps to identify knowledge gaps in ITSM KM.

Creating Questions for Surveys in This Study

Survey questions are the main tool for gathering the data through surveys. In this study, the questions for Surveys 1-3 were formulated by AMU KM core team based on the Theory of Planned Behavior (Ajzen 1991). To be applied in the Knowledge Management context in the case company, Ajzen's theory seemed to be the most suitable, as according to Ajzen (1991), an intention to behave in a certain way is determined by three factors: *attitude*, *subjective norm and* perceived *behavioral control* or *self-efficacy.* According to this theory, *attitude* towards a particular behavior is described as the person's positive or negative feelings about performing this behavior. *Subjective norm*, in its turn, is described as the person's perception of others' beliefs that he/she should or should not perform as a behavior (for example, line manager, colleagues). Finally, *perceived behavioral control* is described as the person's perception of the difficulty of performing a particular behavior. (Ajzen 1991). This theory was utilized for formu-

lating survey questions intended to reveal the attitudes and behaviors of the application support specialists in the AMU unit in utilizing and not utilizing Knowledge Management tool and process in their daily work.

Figure 2 illustrates Ajzen's theory of planned behavior.

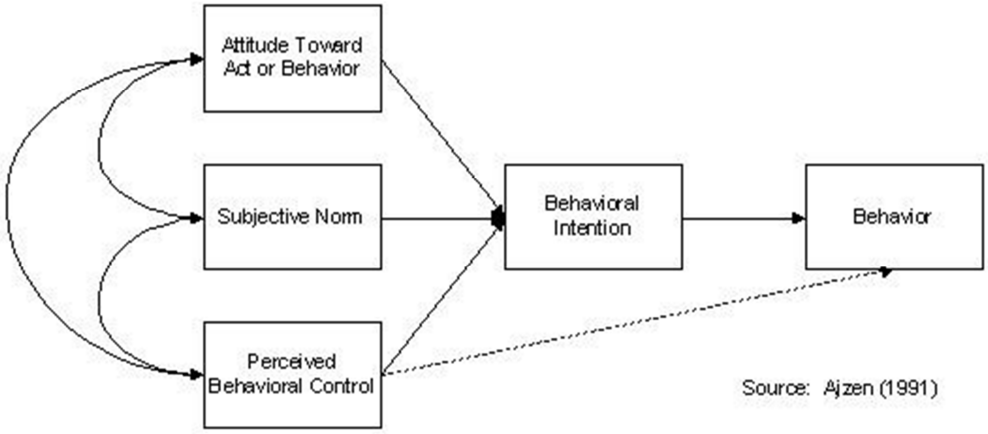

Figure 2. Theory of planned behavior by Ajzen (Adopted from: Journal of Knowledge Management, 2010).

As can be seen from Figure 2, the link between the attitudes and behavior, demonstrated in an act or behavior, is based on subjective norms and perceived behavioral control of a person, which together shape the person's behavioral intentions and actual behaviors.

Two types of questions were used in the Surveys 1-3: 1) yes/no questions; and 2) open-end questions (both as *questions* requiring an answer and as *statements in the affirmative form* requiring continuation of the statement). The survey questions can be classified into questions, a) those seeking demographic information from the respondents (region, company information, role in AMU, role in ITSM KM, etc) and b) those seeking opinions from the respondents about Knowledge Management process. These latter questions can be also classified as Ajzen's theory variables: i) those showing *attitude* toward behavior, ii) those related to *subjective norm* , and iii) those perceived as behavioral control. The open-end or open-comment questions in this study were used for getting understanding of respondents' needs and suggestions regarding the current Knowledge Management process. Table 1 below shows examples of the questions used in this study.

Table 1. Examples of the questions used in this study.

i)Attitude:
Q12: The reason *why my experience with ITSM Knowledge Management is (very) good is* ……..
ii) Subjective norm:

Q20: *"My Line Manager is promoting/encouraging the use of ITSM Knowledge Management"*
Yes / No

iii) Perceived Behavioral control:

Q24: "How competent do you think you are in using the ITSM Knowledge Management tool?"

……..

The formulation of Survey questions was done by the AMU KM core team collectively, prior the researcher joined the process. The collected responses were analyzed by the researcher and the most critical from the Incident Management point of view (see Section 7.1.1) were chosen for tackling in this study and later on for developing the initial proposal to improve the KM process in the AMU. The full list of questions for Surveys 1-3 are collected in Appendix 3.

The methods used for the data collection and analysis are described below.

2.3 Data Collection and Analysis Methods

This study draws data from a wide range of sources. Data used in this study were collected via four surveys (Surveys 1-3, 4), three workshops (Workshops 1-3), two pilots (Pilots 1-2) and interviews (1-2). Surveys 1-2 were conducted before the researcher has joined this initiative.

To help readers of this Thesis, Figure 3 below shows the events of the research process presented in the time order.

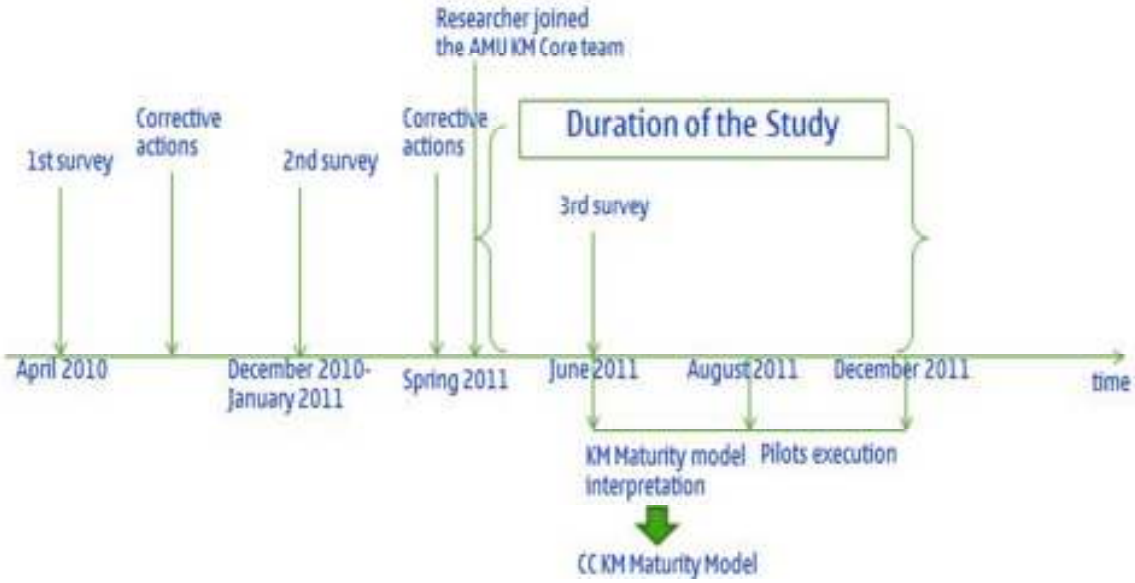

Figure 3. Timeline and sequence of data collection steps in this study.

As can be seen from Figure 3, the improvement of the existing Knowledge Management process started in April 2010, when Survey 1 was conducted. Based on the results of Survey 1, corrective actions were taken in the case organization. After that, Survey 2 was conducted in December 2010 - January 2011, which resulted in a second correction actions plan implemented during the spring 2011. That was the moment when the researcher joined the AMU KM Core team and from that time on participated in the KM improvement project. Following these results, Survey 3 was launched in June 2011. The purpose of that survey was to understand KM improvement needs after all the actions taken so far and act upon them. During the summer 2011, CC KM Maturity model was developed based on APQC's KM Maturity model. Later on, the CC KM Maturity model developed by the AMU KM Core team was applied on two applications within AMU (Pilots 1-2). A detailed description of all the stages in data collection is given below.

Surveys 1-3, 4

The purpose of Surveys 1-3 was to investigate the Knowledge Management situation in the AMU unit, find its weak spots, search for ideas for possible improvements, and finally to measure these improvements. Respondents of Surveys were approached by an email which included a link to a survey. Table 1 illustrates the details of the three surveys conducted in AMU during 2010-2011.

Table 1. Background facts of executed surveys in AMU, in 2010-2011.

	Number of survey forms sent	*Number of participants*	*Response rates*	*Positions/ expertise of participants in the case company*	*Dates of conducting Surveys*	*Survey questions, located in*
Survey 1	280	126	45%	• Support specialists • Line Managers • Others	April 2010	*Appendix 3*
Survey 2	234	81	34,6%	• Support specialists • Line Managers • Others	December 2010-January 2011	*Appendix 3*
Survey 3	218	110	50.4%	• Support specialists • Line Managers • Others	June 2011	*Appendix 3*

As seen in Table 1, Survey 1 was conducted during April 2010. 280 people were sent a survey form, and 126 persons took part in Survey making the response rate for Survey 45%. Majority of participants were from EMEA and APAC region, 47% and 45 % respectively, and their positions and expertise in the case company mostly represented application support specialists.

Survey 2, identical to the first one, was open for responses during December 2010-January 2011 to measure the improvements regarding KM after the corrective actions executed after Survey 1. 234 people were sent a survey form, and 81 persons responded to Survey making the response rate for Survey 34,6%. Majority of participants were from EMEA and APAC region, 41% and 46 % respectively, and their roles were represented by application support specialists.

Finally, Survey 3, a reduced version of Survey 1 and Survey 2, was conducted during June 2011 to follow on the progress of KM process and understand the impact of corrective actions executed after Survey 2. A survey form was sent to 218 people, and 110 persons have taken part in Survey making the response rate 50.4%.

Additionally, the researcher herself has conducted Survey 4 among her own team in May 2011 which was devoted to the application to be improved in Pilot 2. Survey 4 was conducted among the support specialists working with application involved in Pilot 2. The purpose of this survey was to understand the current situation of Knowledge Management process prior the implementation of Pilot 2. The email with a link to the survey was sent to 12 team members, and 4 persons have taken part in Survey making the response rate 33%. Survey 4 questions are located in the Appendix 4.

In all four Surveys, the responses to open-end questions obtained from the interviews were analyzed using the *Content Analysis* method. Content Analysis is a data analysis method with main benefits of being systematic, replicable technique for content to be analyzed for frequencies and to be later coded into fewer categories (classified), based on explicit rules of coding, with the intention to make inferences. For the classification procedure to be reliable it needs to be consistent; i.e. different people should code the same text in the same way. The following items are typically covered in every Content Analysis: the data analyzed, the definition of analysis, the population from which the analysis are drawn, what is the context relative to which the data are analyzed, what are the boundaries of the analysis and what is the target of the inferences.

Workshops 1-3

In addition to Surveys 1-4, a series of workshops was conducted in order to interpret the KM maturity model by APQC to CC KM Maturity model in terms of behaviors, exit criteria and measurements (Section 6.1). The details of the workshops are summarized in Table 2.

Table 2. Details of the Workshops (based on the KM Maturity Model).

Event	*Participants*	*Dates*	*Duration*	*Documents*	*Questions/topics/ brief descriptions*
Workshop 1	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	01.06.2011	1h	Memo and field notes	*Appendix 1* and *Section 6.1*
Workshop 2	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	27.06.2011	2h	Memo and field notes	*Appendix 1* and *Section 6.1*
Workshop 3	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	12.08.2011	2h	Memo and field notes	*Appendix 1* and *Section 6.1*

As seen from Table 2, three workshops were organized and participated by the re searcher and two line managers supervising the application support specialists. All individuals who participated in the workshops were directly involved in the business process being studied. The results of the workshops were documented in field notes and memos, and are summarized in Appendix 1.

The purpose of the workshops was to evaluate the levels of the APQC KM Maturity Model. APQC KM Maturity Model is a five level maturity model to organize the Knowledge Management process. The model was chosen for this initiative (and implemented in Pilots 1-2) for reasons of being easy to use for evaluation and easy match with the case company practices.

Pilots 1-2

The outcome of the three workshops, resulting in the development of the CC KM Maturity model, was used for developing Pilots 1-2. A pilot in this Research is the process of applying of CC KM Maturity model to a particular application (one in the AMU scope).

Table 3. Details of Pilots 1-2.

Event	*Launched by*	*Dates*	*Documents*	*Summary / brief descriptions*
Pilot 1	AMU	August – December 2011	Internal report	*Appendix 2 and Section 6.2*
Pilot 2	AMU	August – December 2011	Internal report	*Appendix 2 and Section 6.2*

As seen from Table 3, two pilots were launched in August 2011. The purpose of the pilots was to investigate how the current applications correlated with the levels of the KM maturity and, by implementing the KM-related corrective actions, to move them to the highest KM maturity level possible at the current stage (Section 6). The results of the pilots were documented in the internal reports which are summarized in Section 6.2.

Interviews

Validating proposal introduced in Section 7.3 (Building Proposal for the improved KM process) was done via 2 interviews. The input from the interviews was later used to compose the final proposal. The details of the interviews are given in Table 6.

Table 4. Details of the interviews held for the validation of proposal.

Interview	*Participants (positions)*	*Dates*	*Duration*
1	Support specialist, AMU	25.05.2013	1h
2	Support specialist, AMU	25.05.2013	1h

As seen from Table 4, two interviews were conducted with support specialists working in AMU. Both of interviewees were directly impacted by the business problem in question. The purpose of the interviews was to validate the final proposal.

2.4 Reliability and Validity Considerations

According to Thyer (2001) following scientific method is important from the point of view of achieving minimization of bias and empirical groundedness in researches. Two important characteristics of qualitative studies are reliability and validity which should not be compromised.
Reliability is defined by Easterby-Smith et al. (2008) as "consistency of measurement in a composite variable formed by combining scores on set of items". Reliability is about ensuring that similar observations will be gained by different researchers by following the study methods (Easterby-Smith et al. 2008: 109). On the other hand, Yin (2009) state that research reliability can be ensured by capability to display that the same results will be achieved by using different data collection methods (Yin 2009: 45). There are internal and external reliability, the former is the extent to which other researchers would be able to reach the same conclusions as the researcher did, given the same predefined information; the latter refers to the ability of independent researcher to do the same.

Validity of research is about to what extent research measures and findings provide accurate representation of what they describe; validity aims to answer the question if sufficient number of perspectives were taken into account and if measures were close to reality (Easterby-Smith et al. 2008: 109).

Therefore, before starting research project, it is very important to gain deep insight into research methods available so that the most appropriate can be chosen to address research problem. Additionally, appropriate data collection methods and tools need to be chosen that suit the research need. Moreover, planning and later describing research activities is necessary from validity and reliability point of view. Also, Thyer (2001) points out the following can increase reliability and validity of a research: appropriate research methods need to be used so that data collection is accurate, interpretation of collected data is *empirical* and *logical* (Thyer 2001: 273-275).

3 Current State Analysis of Knowledge Management in the Case Company

This section start with an overview of the technical architecture of Knowledge Management in the case company, and proceeds to the discussion of the results of the current state analysis based on Surveys 1-3 and Survey 4 conducted in the case company.

3.1 Technical Architecture of Knowledge Management

Current technical architecture of Knowledge Management in the case company unit includes the following elements: a) the AMU unit; b) BMC Remedy IT Service Management (ITSM) suite for handling IT service related processes such as Incident Management and Knowledge Management, and c) the current KM architecture is ITIL compliant.

The AMU unit is a part of the case company IT department which is responsible for monitoring and resolving ITSM tickets, which comprise of incidents and service requests, and providing functional knowledge and training regarding the existing IT applications in the AMU scope. The customers of the unit are *Key Users* of the AMU applications who are in contact with application End users to help them solve applications related issues/problems. Thus, the majority of ITSM tickets are submitted to AMU by applications' Key Users.

AMU Application Support process

Figure 4 below represents the composition of application support levels in AMU.

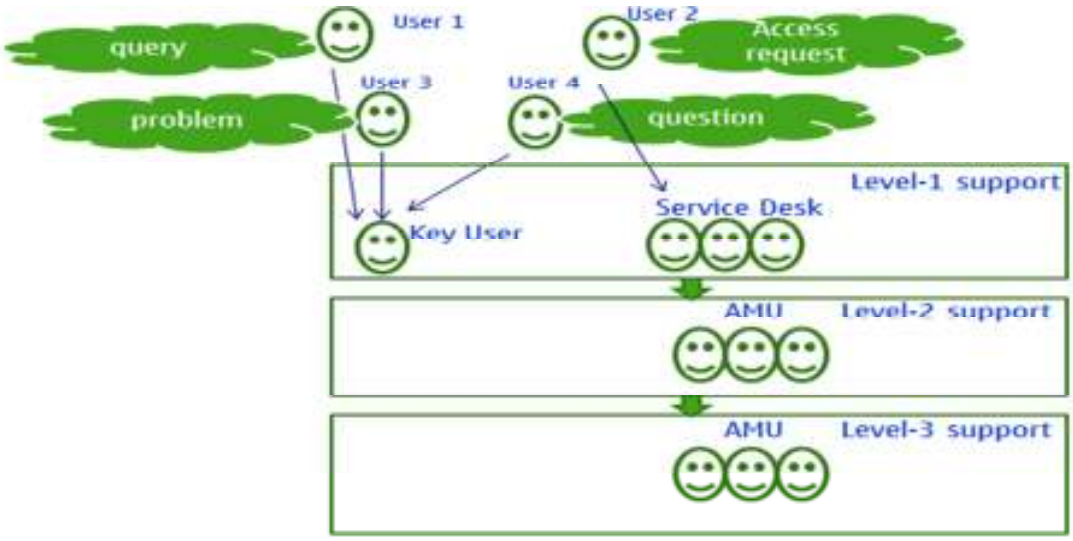

Figure 4. Application support in AMU.

As can be seen from Figure 4, whenever an application user has a question, a query or a problem related to the application in AMU scope, he/she contacts a *Key User* of that application who

represents Level-1 support in the case company. In case the Key User is unable to resolve the issue, he/she creates an ITSM ticket to the AMU Level-2 support; in case of service requests, it is mandatory for a Key User to create an ITSM ticket for further fulfillment. In some cases, questions, queries or problems related to an application are reported to the Service Desk, who also acts as Level-1 support. In that case, the Service Desk creates an ITSM ticket on behalf of a requestor and redirects it to the ITSM tool to Level-2 support which are AMU support specialists. If the ticket cannot be resolved by Level-2 support, it is escalated to AMU Level-3 support for the resolution.

Ticket resolution process

Presently, the AMU unit maintains several support models. Most of the AMU critical applications are supported on a 24/7 or 24/5 basis by applying Follow-the-sun Model of support. Less critical applications are supported by the AMU unit during EMEA working hours only. Currently, this application support is provided by both company internal personnel and external subcontractors.

The process of the ITSM tickets resolution in the case organization is described in this chapter and depicted in Figure 5 below.

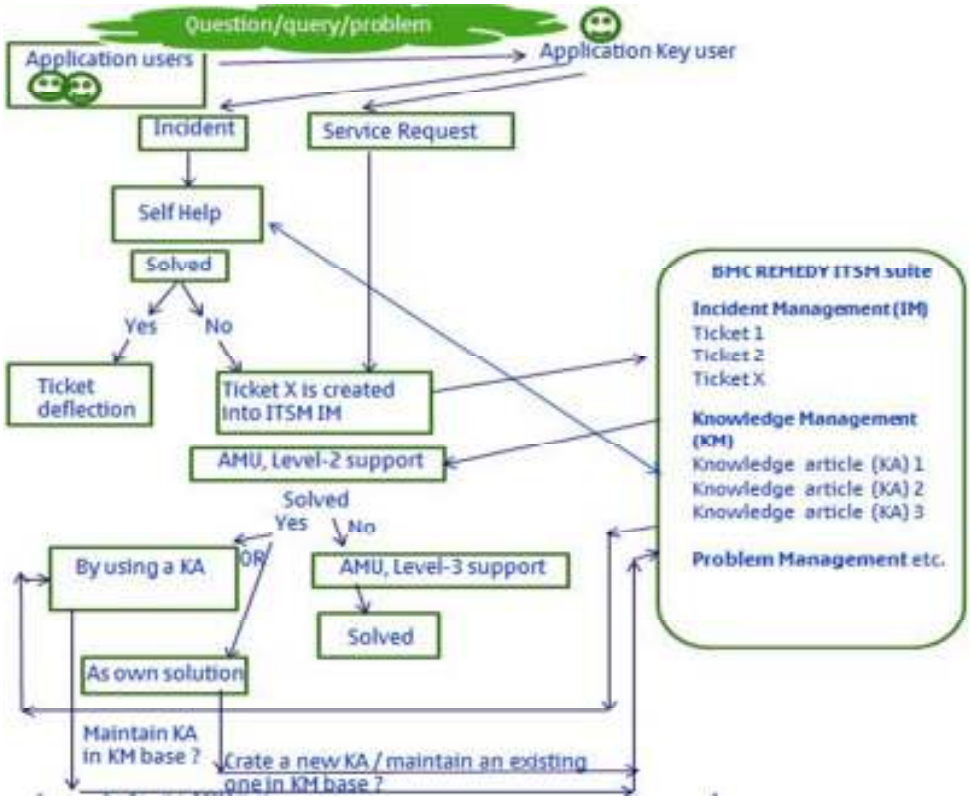

Figure 5. The process of ITSM tickets resolution in the case organization.

As seen from Figure 5, whenever an End user has a question/query/problem related to an application, he/she contacts the Key user of that application. If the end user's issue is a Service Request (e.g. access to an application), the Key user creates an ITSM ticket categorized as Service Request to the ITSM tool. In the cases other than Service Requests, the Key user is supposed to check if the issue reported by the End user is something else than Service Request, he/she is supposed to first check if the solution to the issue exists in the Self Help, in that case the ticket deflection happens. In different cases, an ITSM ticket needs to be created, which will be stored in Incident Management module of ITSM tool.

Next, the ticket will be taken for handling by the AMU Level-2 support specialist. In case the issue can be solved at this level, the specialist will solve it in one of two ways: on its own (as separate solution) or by using the existing Knowledge article as the solution to the issue. If the ticket cannot be resolved by the AMU Level-2 support specialist, it will be escalated to the AMU Level-3 support for the final resolution.

As can be also seen from Figure 5, Knowledge Base can be updated by AMU Level-2 support specialists anytime in the form either of new Knowledge article or modification of the existing one.

Knowledge Management Tool

As for the tool utilized by the AMU application support specialists, it is *the* BMC Remedy IT Service Management suite. This tool was deployed in the case company in 2009. This case company BMC Remedy ITSM tool is used for handling incidents and service requests (Incident Management), feedbacks, problems (Problem Management), known errors, changes, configuration items and knowledge articles (Knowledge Management). Figure 6 shows the structure of the existing BMC Remedy IT Service Management suite (based on: BMC Remedy Action Request System). Figure 6 below presents the simplified view of BMC Remedy IT Service Management tool deployed at the case company.

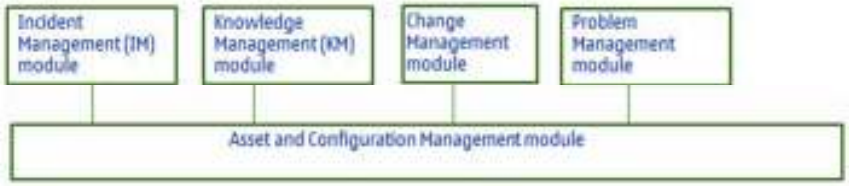

Figure 6. Simplified view of BMC Remedy IT Service Management suite in the case company.

As shown in Figure 6, the current BMC Remedy ITSM suite consists of the following modules: a) Incident Management b) Knowledge Management, c) Change Management d) Problem Management and all these modules are connected to the Asset and Configuration Management module.

The current *BMC Remedy ITSM suite* in the case company is a service process management platform which includes, among other elements, the Incident Management and Knowledge Management consoles. These are the consoles which create the focus of this Thesis. These two consoles are used for handling ITSM tickets (incidents and service requests) and knowledge (in form of knowledge articles) respectively.

The third element of the technical architecture of Knowledge Management in the case company is *the ITIL framework* which is applied in the case company. The case company uses ITIL as guidelines in its IT work. Regarding Knowledge Management and Incident Management, ITIL defines *incident* as an event which causes, or may cause, an interruption in a IT service or a reduction of its quality while *service request* is defined as a request from a user for information, or advice, or for a *Standard Change* or for access to an IT service (ITIL 2007). The goal of Incident Management is to restore a service to its normal operation as quickly as possible with the least possible impact on either the business or the user, and do it at a cost-effective price. One of the critical success factors of ITIL Incident Management is resolving incidents within an established service time. (The ITIL Open Guide)

Organization of Knowledge Management

Currently, the case company BMC Remedy Knowledge Management includes the following main components: A) *Self-Search* (an interface where any company user can search for a solution to a problem from the existing Knowledge Base), and B) *Knowledge Management Console* which allows the AMU support specialists to create new knowledge articles, and to view and edit the existing ones and their metadata.

In the case company ITSM Knowledge Base, applications-related knowledge is stored in units called *Knowledge Articles*. A knowledge article captures an issue and describes a solution to a problem, answers a question, provides referential information, or describes a process (Case company internal document).

Figure 7 shows the layout of a typical knowledge article in the case company.

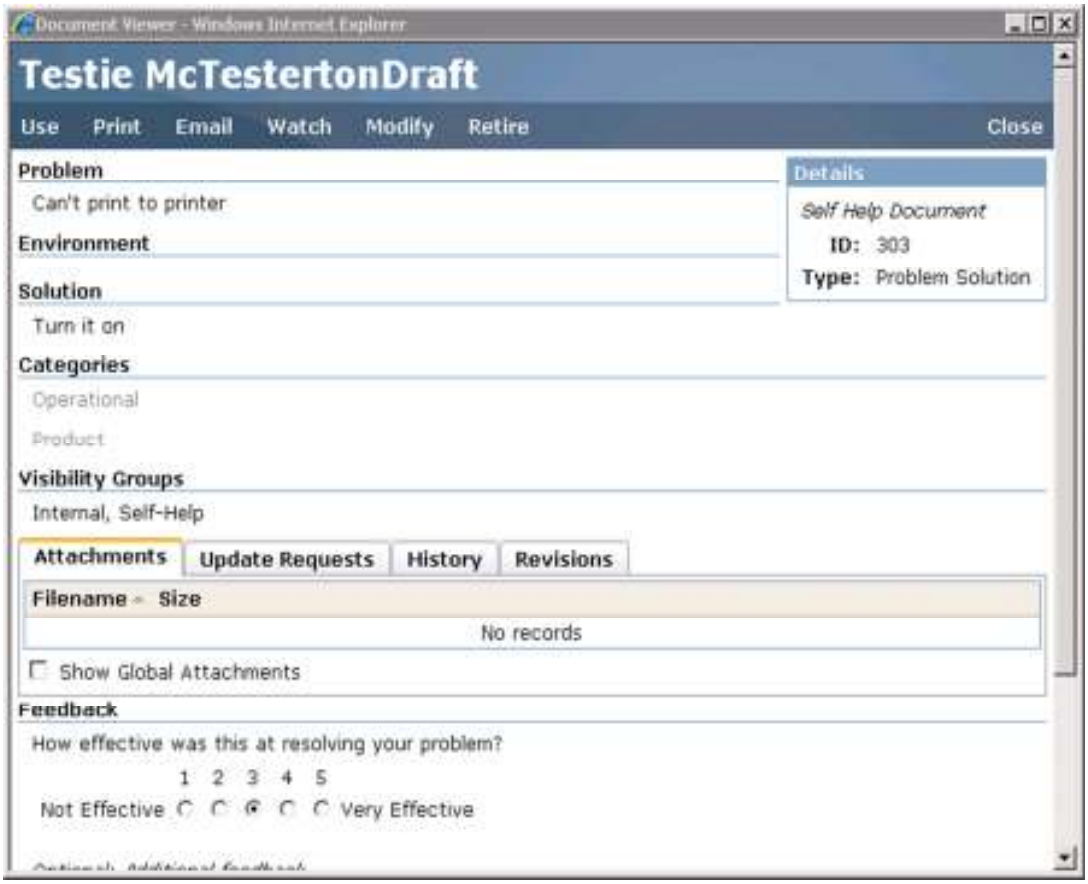

Figure 7. An example of a knowledge article (Adopted from: BMC Community).

As seen from Figure 7, a typical knowledge article comprises a set of characteristics including: describing a problem (Problem), indicating the environment (Environment), describing the solution to the problem (Solution), defining the operational and product category (Categories), indication of the visibility group(s) (Visibility Groups), and feedback to the suggested solution. All these features are included in the description which, taken together, constitutes a knowledge article.

Knowledge articles are used by the AMU application support specialists to make input of a piece of information about a problem occurred or an issue at hand, so that the existing knowledge becomes available for the company end users. When shared, this knowledge becomes available, depending on the visibility group set, in either the Self-service (visible to all company users) or Knowledge Management console (accessible by support personnel only).

The existing system is organized in such a way so that the integrations of the BMC Remedy AR System allow the BMC Remedy Knowledge Management to communicate and share data, which makes Knowledge Articles available for the purpose of e.g. facilitating incident resolution.

3.2 Current Challenges in Knowledge Management

To reveal the challenges for improving the KM process in the case company, the results of Surveys 1-3 were analyzed in detail and categorized for taking improvement actions.

3.2.1 Investigation of Knowledge Management

Prior to the deployment of the existing BMC Remedy ITSM suite, the case company used to apply the Request Management Tool for Incident Management which did not include Knowledge Management functionality. As a result, the AM applications-related knowledge was spread across different locations. The current ITSM suite was deployed in the case company in 2009, which was chosen for its compliance with ITIL framework.

In 2010, to effectively maintain the existing BMC Remedy system, the case company formed the AMU Knowledge Management core team with the purpose of developing Knowledge Management within AMU. Presently, the AMU Knowledge Management team consists of nine people with the following roles: application support specialists, line managers, specialists in supplier management, and a senior specialist. The competencies of the team are vested in knowledge, supplier and team management.

In April 2010, the newly formed AMU Knowledge Management core team organized the first KM-related survey among the AMU employees (Survey 1). The purpose of Survey 1 was to identify the current and the needed utilization of ITSM Knowledge Management, its development needs within AM, its weak spots and ideas for possible improvements. Survey 1 discovered that a considerable proportion of respondents, who were application support specialists, were not using ITSM Knowledge Management on a regular basis and had a very limited experience in using it in general. Figure 8 below presents graphically a) current state of ITSM KM usage and b) respondents' experience with ITSM KM at Survey 1 time.

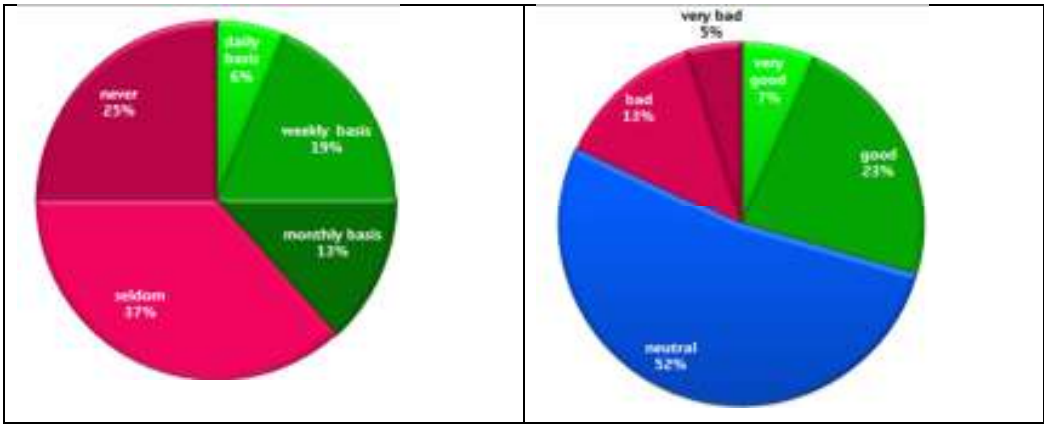

Figure 8. ITSM KM usage basis (left image) and Experience with ITSM KM (right image), Survey 1

As can be seen from Figure 8, at the time of Survey 1, only six percentages of respondents were using ITMS KM on daily basis and on the contrary, twenty five percentages of respondents have never used it. Moreover, half of the respondents had neutral attitude towards ITSM KM, however, eighteen percentages had bad or very bad experience with the tool.

As Knowledge Management is considered an important asset of the AMU in the case company, another two surveys were conducted during 2010-2011 to investigate the Knowledge Management situation within AMU (Surveys 2 and 3).

Survey 1 conducted in April 2010 covered 126 persons (against 280 surveys sent) making the response rate for Survey 45%. The majority of participants were from the EMEA and APAC regions, representing 47% and 45 % respectively; and their roles were was mostly represented by application support specialists.

In Survey 1, 62% of the respondents indicated that they were not using ITSM Knowledge Management functions on a regular basis, with 52% having limited experience in using it in general. The majority of respondents, however, believed in the benefits of Knowledge Management for the case company.

Regarding the encouragement/promotion of a wider use of ITSM Knowledge Management, less than 50% of the respondents stated that such usage was encouraged/promoted by their product team or colleagues; but 64% responded indicated that such usage was encouraged by their line manager.

At the time of conducting Survey 1, 49% of all the respondents considered themselves as learners regarding competence in using the ITSM KM tool. Additionally, 79% of the respondents were talking positively about using ITSM Knowledge Management in various meetings. The

complete list of questions asked in Survey 1 is enclosed in Appendix 4. Conclusions drawn from the first survey indicated that a large proportion of respondents were not using KM functions on a regular basis and had a limited experience in it.

Based on the responses received in Survey 1, a series of actions were taken by the AMU unit to modify the existing Knowledge Management process, including; a) launching additional ITSM KM tool- and KM process trainings, KM related info sessions, newsletters; b) promotion of Self-Help channel in email signatures (whenever there is a mail sent, there is a little promotion sentence and a link to the Self Help at the end of the email) and when calling to Service Desk (when a user dials for Service Desk, a recording with promotion of Self Help would be played back to him/her before the call will be picked by a Service Desk personnel), and other, similar steps. Additionally, new requirements were created to improve the existing ITSM KM functionality in terms of improving its usability and availability. This was proposed to be done by implementing a new, updated version of the ITSM KM in the company.

Following Survey 1, in Dec 2010 - Jan 2011, *Survey 2,* identical to the first one, was conducted to measure the improvements regarding KM in the case company. In Survey 2, 81 persons responded to Survey questions (enclosed in Appendix 2). The majority of participants were from the EMEA and APAC region, representing 41% and 46 % respectively, and their roles were mostly those of an support specialist. Figure 9 below overviews Survey 2 respondents' ITSM KM usage basis and their experience.

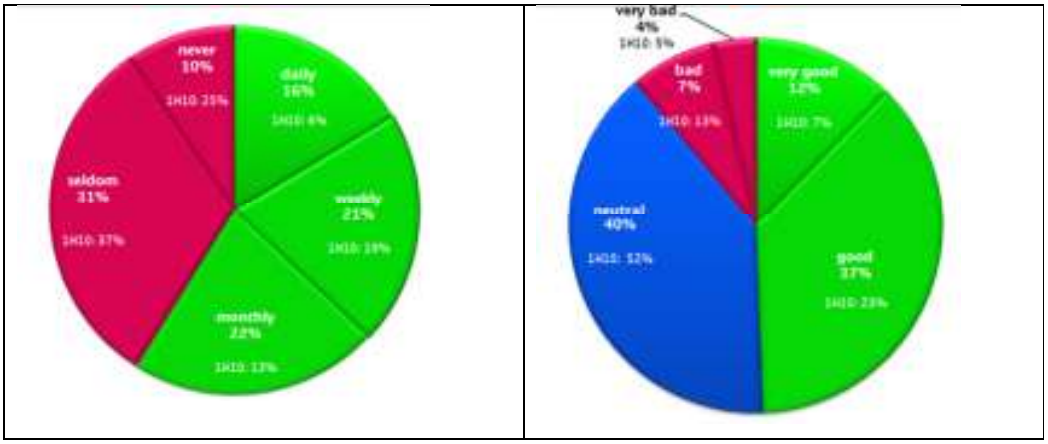

Figure 9. ITSM KM usage basis (left image) and Experience with ITSM KM (right image), Survey 2

As Figure 9 graphically demonstrates, graphically demonstrates, 41% of respondents were not using ITSM Knowledge Management functionality on a regular basis, 40% had neutral experience but unfortunately 11 % of respondents had bad or very bad experience about using it.

Additionally Survey 2 showed that the majority of respondents however believed in the benefits of ITSM Knowledge Management. Regarding the encouragement/promotion for using ITSM Knowledge Management, the majority responded that the use of it was encouraged/promoted by their product team, colleagues, or line managers. However, only 71% of the respondents felt competent in using the tool.

The conclusions from Surveys 1-2, which pursued a diagnostic purpose, identified the KM-related problems in the case company and pointed that: a) Knowledge Management in AMU needs to be developed so that it would support the Incident Management process, and b) these improvements should be made in terms of reducing the incidents resolution times and deflection of incidents. To follow on the progress of the Knowledge Management after the corrective actions, the third ITSM KM survey (Survey 3) was scheduled for June 2011.

3.2.2 Findings from the Current State Analysis of Knowledge Management

Based on Surveys 1 and 2, five main reasons for ITSM KM not being utilized in the case company AMU unit were identified. Among them, the following main reasons were indicated: the value of Knowledge Management/knowledge creation was not understood by the users; the skills for the convenient use of the system were missing; the system itself demonstrated instability; concerns about protecting personal expertise; the case company had a number of other tools where the knowledge about applications was stored.

Survey 2, conducted seven months later, confirmed the main reasons for ITSM KM being unused which were discovered in Survey 1, as well as added some new information. The main reasons for ITSM KM not being used were, again, the missing skills for using the system; not understanding the value that Knowledge Management provides; the system itself being unstable. The new information revealed in Survey 2 was that the knowledge available in the KM system was found outdated. These reasons (from both Surveys 1 and 2) are considered in more details below.

Finding 1. Skills for Using the New Tool Are Missing

The informants indicated that they were experiencing difficulties in using the ITSM KM tool. They described their difficulties by stating that the tool is: too complex and time-consuming to use; the search of information in it requires too much time.

> *It seems to be time consuming and complicated to use* (Survey 1)
>
> *Also it requires extra time, which I don't have* (Survey 1)

Use is not that easy, and search is a bit tricky (Survey 1)

Based on the results of Surveys 1 and 2, the AMU team categorized and interpreted this type of feedback as current challenges due to a lack of skills among the users for the efficient use of the tool. As the tool was deployed in the case company quite recently, not everyone had time to attend the tool training and many users were not aware of its functionalities. Consequently, AM KM team suggested an action point to address this challenge and re-arranged the KM process and tool trainings for the AMU unit support specialists.

Finding 2. Knowledge Management Value is Not Understood

Survey responses indicated that the AMU support specialists did not recognize value in using the existing Knowledge Managements process and tool. They described their ways of working as those that they traditionally used (old tools and methods") and do not perceive KM as essential or benefiting their daily job.

I don't find the necessity to use KM in my day-to-day work. (Survey 1)

I don't expect any help from it (Survey 1)

Do not recognize it is essential tool for daily base job yet. (Survey 1)

I am used to the old ways (Survey 1)

Have had no interest to do so, no urgent articles to write either. (Survey 2)

Old tools and methods take my time, my customers don't benefit from ITSM Knowledge Management (Survey 1)

I am still not sure what are the benifits of using ITSM KM comparing to Share point/Team tool/Share drive/Intranet search..etc. (Survey 1)

As can be seen from these examples, these attitudes demonstrate that the users do not ascribe any value to the existing KM tool due to a perceived lack of need to apply them; an expected lack of help from these tools; and a lack of enthusiasm to learn new skills. Some indicated that they see no ways how these new tools can directly benefit their customers, which all can be interpreted as a wrong understanding of the KM tools value.

Finding 3. Systems Technical Failures/Limitations

The informants indicated that currently the tool (ITSM KM) had inner limitations and gave examples of technical deficiencies that prevented them from using it, most probably this results from the tool being new, at least during time of execution of Survey 1. They described their difficulties by stating that the tool: is too slow; it has the amount of knowledge is less than they expected; difficult to use, Knowledge articles' approval process (in the ITSM KM) being too complex at the moment:

Application is quite slow (Survey 1)

It's very inconvenient to use (Survey 2)

Is this tool easy to use or a burden on techs? (Survey 2)

too complicated approval process (Survey 2)

I do not know the next approver to approve my ticket. (Survey 1)

Based on these responses from the informants, the AMU team categorized this type of feedback as current challenges due to the system own technical failures/limitations.

Finding 4. Concerns About Protecting Personal Skills

Responses to Surveys 2 showed that the users were concerned about protecting their personal expertise, as of being afraid that the application one supports will be eventually offshored, as one of the reasons for lacking motivation for knowledge sharing in ITSM KM:

Human laziness & protective back-in-the-mind thinking (Survey 2)

I got the knowledge so why bother, I can teach if someone asks (Survey 2)

Why share my long term gained skills to offshore-on-a-plate (Survey 2)

The attitude of not willing to share one's expertise is having a big impact on the Incident Management process in terms of availability of knowledge in ITSM KM and possibly in Self-Help which can a) speed ticket's resolution time or b) deflect a ticket.

As these examples illustrate, Surveys participants indicated several most obvious barriers to knowledge sharing, including those as protecting their individual/team expertise (for example, against other service providers, especially competitors from offshoring companies); not seeing any value in knowledge dissemination, if not protecting them from those in the same team ("I can teach if someone asks"), and a lack of enthusiasm to share either due to "laziness" or "work overload".

Finding 5. Overlap in Storing Knowledge Items

The respondents indicated that the case company had a number of other tools where knowledge about applications was stored in parallel to ITSM KM. There are multiple information storage tools available in the case company, e.g. Wiki-, and Intranet pages, Team tool, Doclib,

SharePoint etc. Therefore applications knowledge already exists somewhere, sometimes even over several tools, which makes maintenance of knowledge difficult. An additional difficulty for support specialists was that, in this case, knowledge stored in other locations than ITSM KM, cannot be used directly for ITSM tickets resolution.

Open comments related to the subject included the following descriptions:

> *Had no time to do and the needed info is available in the other sources at the moment.* (Survey 1)
>
> *Lack of time. Also most of the applications I support have their own Wiki and knowledge management tools where I can find more details on the specific area I need information on quickly."*(Survey 1)
>
> *My work is mainly focused to regular tasks and the quantity of the requests keeps me really busy. If I need some additional info from some other field of expertise, I usually check out the intranet pages from that particular service.* (Survey 1)
>
> *Everything I need I can find somewhere else. I'm not familiar with KM yet, and I do not remember I could try that too.* (Survey 1)

As these examples show, Surveys participants clearly pointed to two related reasons: the case company has other tools for maintaining knowledge (intranet pages, Wiki and various "other sources"). The other reason is the time needed to either learn or use the discussed KM tool. Most of the respondents believed that it should require a considerable time span which they do not plan to waste on it.

Other Findings

If these five were the most frequently mentioned findings about the researcher KM tool, Surveys results also pointed to some other interesting findings. For example, on a more general level, in more than one survey, the respondents pointed to the fact that *Application Level KM Strategy is Missing:*

> *If there is no clear plan on application level on how to use KM, then it will no add any value to us at AMU, or to the users of the applications. I do not believe in forcing down the application use through generic personal incentive targets will result to good quality KM (setup and document entries), but it needs to come from each and every person understanding and agreeing the utilization plan set for each application, based on that application's user base needs. The problem with asking everyone to enter X amount of Knowledge articles in the tool, will not guarantee the content is a) valid and usable as such b) will be used and updated by someone (or anyone?) c) is in line with what is needed, unless there is a plan behind it all (starting from how do we categorize the entries in different areas, how do we do the review of entries, how and when do we roll out KM towards the end users/customer, how do we maintain the content, etc. etc.). To be effective, this all needs to come to common consensus and commitment."*

> *KM utilization needs to be driven on the application level, as the approach (incl. what and how, and to whom) differs from application to application a lot.*

Also, respondents brought up challenges with the current process of Knowledge articles creation such as modification of Knowledge articles being too difficult, Knowledge articles being outdated:

> *Could it be easier to modify or delete the article?* (Survey 1)

> *Hove to ensure that article you find is up to date? Just happened that I found an attachment how to install XXX via XXX and happened that the document was not up to date.* (Survey 2)

These open-end comments points to all main pain points of the KM process: no KM strategy on a lower, application level as opposed to organization (AMU) level KM strategy; lack of added value in using the KM tool; no connection between using the KM tool and enhanced quality of the customer service; the challenge of creating a truly valuable content as opposed to the formalistic approach of creating x-many articles of knowledge, regardless of the real need of quality of this "knowledge" and very valid replies about making Knowledge articles' creation process easier. These survey replies has also raised such important questions as maintaining knowledge in an organized, orderly manner, taking in mind its customer value and customer orientation. The comments fairly pointed to the need for the common consensus and commitment to turn such a KM tool into a true knowledge creating apparatus. Overall, developing clear KM vision and strategy would solve many problems and address all main challenges facing the KM process in the AMU unit.

Additionally, after conducting Survey 2, the AMU KM core team (including the researcher) identified that each application in AMU scope should have three KM articles (describing a functionality of an application, its support model and the information about its access rights, which all were identified as primary but vital knowledge about any application) in Knowledge base. After the decision has been made, the team has conducted the "KM Basics in Place" exercise to create such Knowledge articles for the critical applications in AMU scope.

Summary of the Challenges in Knowledge Management Process in the Case Company

Based on Survey 1, the following main reasons for ITSM KM not being used in AMU were identified. The first reason was that the value of Knowledge Management/knowledge creation was not understood by the users. The second reason was the missing skills for the convenient use of the KM system. The third reason for ITSM KM being unused was the instability of the system itself. Among other main reasons the respondents also indicated that the case company had a number of other tools where knowledge about applications was stored in parallel to KM and the

support specialists were concerned about the protection of their expertise. Finally, Survey 1 revealed that the two leading reason for neutral/negative attitude regarding ITSM KM were the current system performance and the lacking skills for using it.

Survey 2, conducted seven months later, confirmed the main reasons for ITSM KM being unused, as well as added some new information. The main reasons for ITSM KM not being used were, again, the missing skills for using the system; not understanding the value that Knowledge Management provides; the system itself being unstable; and concerns about protecting personal skills. The three leading reasons for the neutral/negative attitude towards ITSM KM revealed in Survey 2 were: the system performance issues; the lacking skills for using the system (ITSM KM); and the knowledge available in the ITSM KM system being outdated, which was not indicated before.

Overall, based on the results of Surveys 1 and 2, the groups categorized by the researcher for taking further actions were: a) Skills for Using the New Tool Are Missing; b) Knowledge Management Value is Not Understood, c) The KM tool Limitations, d) Concerns About Protecting Personal Skills; and e) Overlap in Knowledge Locations. The responses also revealed that the respondents did not see a clear picture of value in using KM for applications' support.

Additionally, internal documentation and researcher's own experience revealed that knowledge was not created on regular basis but occasionally in the case organization.

On a strategic level, it meant that the KM strategy on single application level was missing as opposed to organization level KM strategy. These challenges were chosen for taking further actions and are also reflected in the proposal developed in this study (Section 7).

For taking further actions and improving the KM process use in the case company, the next step was to conduct a search for existing knowledge and best practices for the possible KM improvements, and investigate the existing best practices to formulate the development proposals.

4 Best practice for IT Service Management

This section presents the theoretical background and best practices related to the focus of this Thesis. First, it overviews the knowledge management best practice of IT service management, including from the point of view of ITIL as the framework adopted by the case company. Then, it discusses knowledge and incident management and the Knowledge-centered support methodology and describes the APQC KM Maturity Model, both applied in the Knowledge Management process in the case company.

4.1 ITIL Framework

IT Infrastructure Library (ITIL®) is a collection of best practices produced by UK Office of Government Commerce for IT service management (ITSM). It provides a framework for the governance of IT service and focuses on the measurement and continual improvement of the quality of the service delivered from both a business and a customer perspective (ITIL 2007). ITIL describes procedures, tasks and checklists suggested for use in organizations for establishing a minimum level of competency for Service Management, so that the organization can plan, implement, demonstrate compliance and measure improvement. (ITIL Official site) This process-based framework is adopted in many organizations.

Since its start in the late 80s, several ITIL versions have been produced. However, the core approach to the ITIL guidance stays unchanged and consists of five basic processes: Service Strategy, Service Design, Service Operation, Service Transition and Continual Service Improvement. These processes represent an ITIL service lifecycle, each of the five influencing and relying on the others. Figure 10 illustrates the processes of ITIL framework.

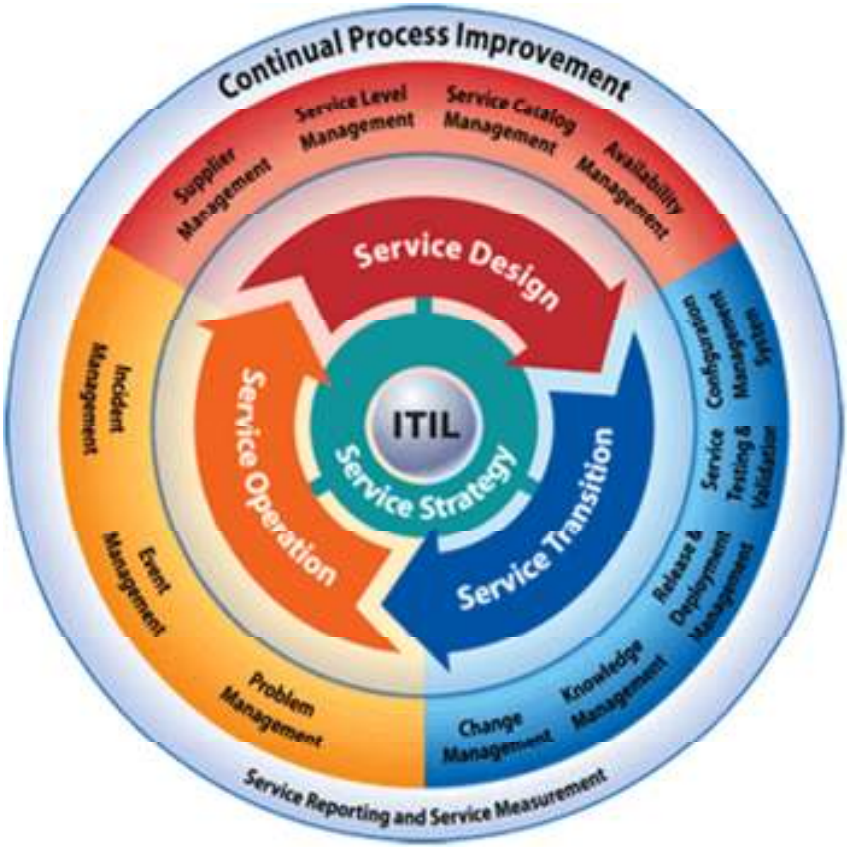

Figure 10. Overview of ITIL v3 (Adopted from: ITIL official website).

As seen from Figure 10, the lifecycle of an IT service starts at the Service Strategy stage where the business needs and requirements for a service are set, and then it circulates cyclically through the Service Design, Transition, Operation and Continual Process Improvement. Every stage of a service's lifecycle has an inbuilt continual feedback system to guarantee that the service is able to provide business with the measurable value continuously.

Service Strategy process aims at aligning business needs and IT. It makes sure that all the other ITIL processes stay focused on the business and that all elements of the service lifecycle is focused are focused on bringing value to the customer. *Service Design* stage focuses on the design of appropriate and innovative IT infrastructure service solutions and processes, particularly on creation and maintenance of IT policies, architectures, and documents to support the service design. *Service Transition* process is concentrated on the transition of a service in the operational business environment. It provides guidance on the ways to deal with, among other issues, knowledge and change management, as well as release and deployment activities which provide their *support* for ongoing operational services. *Service Operation* process provides guidance on service's delivery and control activities in order to achieve operational excellence. Finally, the *Continual Process Improvement* stage deals with the process elements which enable

identifying and introducing service management improvements, and also covers details of service retirement. (ITIL V3 Foundation Handbook)

As shown in Figure 10, Knowledge Management belongs to the Service Transition process of the ITIL framework, and Incident Management is part of Service Operations.

4.1.1 Knowledge Management

Knowledge Management has recently been included as a required process in the ITIL baseline (in the current release ITIL V3, published in June 2007 and updated in July 2011). In ITIL, Knowledge Management aims to gather, analyze, store and share knowledge and information within an organization, and its primary purpose is to improve efficiency by reducing the need to rediscover knowledge. (ITIL V3 Foundation Handbook). KM objectives also include helping a service provider to become more efficient; reduce the cost of a service and improve satisfaction and quality of the service. According to ITIL, the purpose of Knowledge Management is to ensure that the right person has the right knowledge, at the right time to deliver and support the services required by the business (ITIL Official site).

Presently, Knowledge Management is considered as one of the central processes of ITIL supporting all other IT Service Management processes. It is said to be a powerful method to share data, information, and knowledge about all aspects of an IT service.

Knowledge Management, as any process in the ITIL framework, requires a well-defined *Knowledge Management strategy* for its design and implementation, which covers the following issues, among other things: the governance model, roles and responsibilities, funding, policies, processes, procedures and methods, technology and other resource requirements, and performance results.

The KM strategy helps to identify, capture and maintain the relevant knowledge *(Knowledge Capture and Maintenance)*, which includes among other things: a systematic process for organizing, distilling, storing and presenting information so that it is easier comprehended; knowledge needs to be accumulated from processes and workflow; new knowledge needs to be generated and external knowledge needs to be accessed, captured and adapted. (ITIL Service Transition 2007) Additionally, according to ITIL as people learn in different ways, the best method of transferring *(Knowledge Transfer)* and maintaining knowledge within the Service Management is to use various ways of doing it. (ITIL Service Transition 2007)

The concepts of KM strategy, knowledge capture, maintenance and knowledge transfer originate from the concepts of Data, Information, Knowledge and Wisdom. Within ITIL framework, *Data* is described as a group of discrete facts about an event. Most organizations have their data stored in databases such as Service Management and Configuration Management tools/systems. The key activities related to organization data are: a) to identify relevant data, b) get needed resources for capturing the data, c) capture the accurate data, and d) analyze, synthesize, and finally e) transform the data into *information*.

According to ITIL, *information* is data in a context, and it is stored in semi-structured content such as emails and documents. At this stage, it is important for an organization to organize the content so that it enables easy capturing, querying, finding, re-using and learning from experiences which helps elimination of duplicate work and re-occurring of past mistakes. (ITIL Service Transition book 2007)

Knowledge, in its turn, consists of tacit ideas, experiences, insights, judgments of people among others. Knowledge is content-based and dynamic, and it makes information easy-to-use and enables decision making. Knowledge is also collected from the past experiences which organization staff has been *unconsciously* collecting until the current point.

Finally, *Wisdom* is ability to use knowledge to make correct judgments and decisions (ITIL Service Transition book 2007). In ITIL, KM is typically shown by means of Data-to-Information-to-Knowledge-to-Wisdom (DIKW) scheme. Figure 11 presents ITIL flow from data to wisdom.

Figure 11. The Data-to-Information-to-Knowledge-to-Wisdom structure (ITIL Service Transition book, 2007).

As seen from Figure 11, the route of turning the data into wisdom goes through the information and knowledge stages, which are parts of the Knowledge Management process and belong to the Service Knowledge Management System of an organization.

According to ITIL, to manage knowledge and information an organization sets up and uses a *Service Knowledge Management System* (SKMS) which is a set of tools and databases used to capture, maintain and manage knowledge and information.
ITIL recommends having a single SKMS which can be shared, updated and used by all relevant parties across time zones and locations. According to ITIL, the biggest part from the ROI (return on investment) related to KM is *agent efficiency*, which in turn includes the reduced *incident handling time and* the increased *agent productivity.* Additionally, a comprehensive SKMS include the *Self-service* interface which provides users with possibility to access knowledge on the support website and which costs are much lower than the costs of assisted service.

Finally, in this study, Knowledge Management is considered from the point of view of its importance to Incident Management process of ITIL. The activities related to Knowledge Management, which Service Operations staff (i.e. those involved in the Incident Management process) may need to perform on a day-to-day basis, can include the following actions. The first activity is to ensure that *documentation* such as operations and procedures manuals, work instructions, etc. are included in the Service Knowledge Management System. Another activity is to provide *data, metrics and information* (ITIL V3 Foundation Handbook 2007) that can be used by other lifecycle stages of a service.

4.1.2 Incident Management

Incident Management is the ITIL process for dealing with *incidents*, which can be a query, question or failure (existed or possible one) related to a service. Thus, the main goal of Incident Management is to restore service as soon as possible and to minimize impact of incidents on business to ensure the best possible *quality* and *availability* level of a service. By *incidents*, ITIL means any unplanned interruptions to an IT service or a reduction in its quality. (ITIL 2007) Incidents can be reported by users, technical staff and event monitoring tools. When dealing with incidents, the main concepts associated with them are *Impact*, *Urgency* and *Priority* level. Figure 12 below shows an incident in BMC REMEDY ITSM tool and the details associated with it.

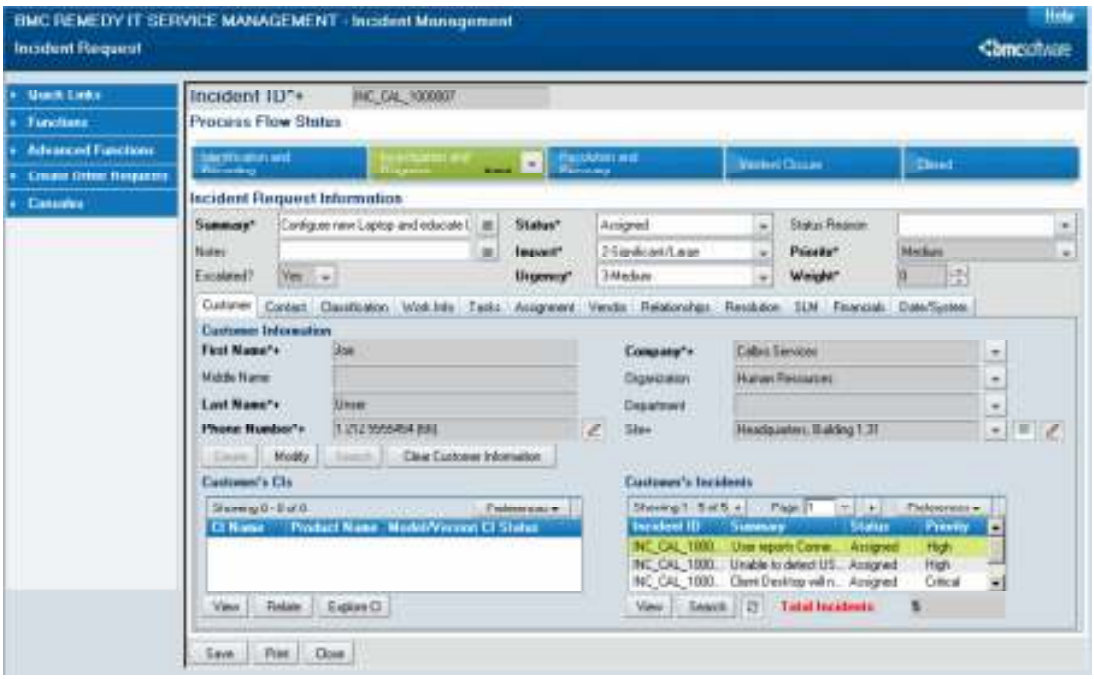

Figure 12. Overview of a BMC REMEDY ITSM Incident Management (Adopted from: User's Guide, BMC Remedy Service Desk: Incident Management 7.6.00).

As can be seen from Figure 12, an incident and its details, e.g. information about the user who has submitted it and incident attributes.

The benefits which Incident Management provide to the business are the following, among the others: detecting and resolving incidents, which results in lower downtime of a service which, in turn, means its higher availability; identifying potential improvements for a service; and identifying requirements as part of handling incidents and contacting business staff. (ITIL: Service Operations 2007)

As it was pointed out earlier, the criteria of the 'normal service operation' is defined in *the Service Level Agreement* (SLA). SLA is critical from the service provision point of view; it documents and defines the IT Service being offered by an IT Service Provider to a Customer, the Service Level Targets, and the responsibilities of both parties. The SLA contains the following details among the others: service- description, hours, availability, reliability, support, performance, functionality, continuity security, charging. One of the most important points of any SLA is the way and terms of how incidents are resolved.

Ticket Resolution Time and Ticket Deflection in ITIL

ITSM tickets contain incidents and service requests. Whenever a user has a question, query or a problem related to an IT service, he/she needs to create a ticket into ITSM tool. It can be done in several ways: by contacting Service Desk, which will create a ticket on behalf of the

user, or as a self-service via BMC Service Request Management portal. Figure 13 below presents the overview of BMC Service Request Management portal.

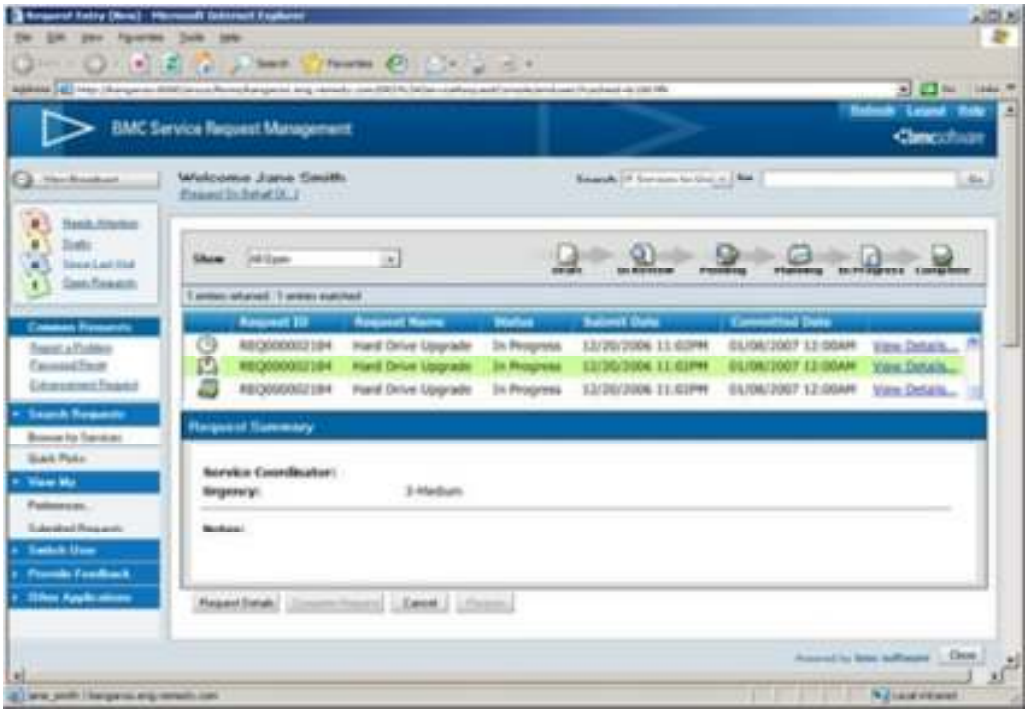

Figure 13. Snapshot of BMC Service Request Management portal (Adopted from: Computerworld).

Incident response and resolution targets depend on their priority level which should be recorded in the service's SLA.

4.1.3 Request Fulfillment process in ITIL

Another important process closely related to Knowledge Management, though representing part of Incident Management is *Request Fulfillment*. Request Fulfillment is the process within the ITIL Service Operation part which deals with users' *Service Requests*. Contrary to incidents, service requests are not disruptions to a service but are means to meet customers' needs, for example, by fulfilling user's requests for information, implementing a standard change or giving access to a service. ITIL defines a *standard change* as "a change that is recurrent, well known, has been proceduralized to follow a pre-defined, relatively risk-free path, and is the accepted response to a specific requirement or set of circumstances, where authority is effectively given in advance of implementation" (ITILv3). Because of their scale and frequent but non-risky nature, they are handled separately from incidents. (ITIL® V3 Foundation Handbook) The scope of Request Fulfillment is decided by an organization.

The value of Request Fulfillment process to the organization is coming from providing the organization's staff with a quick access to standard services, which enables them to be more productive and/or improve the quality of organization services and products. Moreover, Request Fulfillment decreases bureaucracy related to getting access to a service, which once again reduces costs of providing the service. Additionally, when request fulfillment is centralized it is easier to control the organization's services, which reduces support costs.

Request Fulfillment is interconnected with the Incident Management process as some service requests come in via the Service Desk channel and may be handled through the Incident Management process. When an incident becomes the cause for a Service Request, these two need to be related and resolved together, if needed. Similarly to the process of ticket resolution, some service requests will be fulfilled by the Service Desk and some will be forwarded to a specialist group for the purpose of fulfillment.

Finally, even though ITIL framework is well recognized and commonly used in Service Management, it outlines only the most general principles in streamlining the company's processes and does not give any particular recommendations as for sufficient details necessary for implementing Knowledge Management in practice. To help overcome this difficulty, a methodology called Knowledge-Centered Support born as a product of collaboration of various support organizations extends the ITIL framework by specifying how to integrate Knowledge Management within a support organization.

4.2 Knowledge-Centered Support Methodology

Knowledge-Centered Support (KCS) methodology was developed as an initiative of a non-profit alliance of support organizations to address the challenges of the ITIL implementation. KCS is a methodology and a set of practices which considers knowledge as a key asset for a support organization. It aims to capture, structure and reuse knowledge solutions which, in essence, rely on the "collection of information" (KCS Practice Guide).

There are four basic concepts in KCS. The first concept concerns integration of the content (knowledge) creation with the ITIL Incident Management and Problem Management processes. In practice, it means that whenever support personnel deal with an incident, they need to capture the information related to it, and create and publish a piece of knowledge that can be either reused by another specialist or by an end user/customer via Self-service (KCS Practice Guide). According to KCS, when knowledge creation is disconnected from the Incident Management process, which means knowledge is created not at the same time of dealing with an

incident, the knowledge creation process becomes an additional step to be implemented, additionally the context of the issue may not be captured correctly anymore, and as a result of that, duplicate work may occur.

The second concept of KCS specifies that the content of KM articles needs to be evolved based on demand and usage by the customers, so that to lower the costs of Knowledge Management maintenance. When support specialists interact with the Knowledge base during Incident Management, their task includes reviewing the knowledge article before presenting it to a customer. In case a piece of knowledge needs maintenance, it needs to be corrected at the same time or, in case of missing modification rights, it needs to be flagged for another specialist's correction (KCS Practice Guide). By following this process, the content will always be evolved on the demand basis *versus* a random "just-in-case" basis.

The third concept of KCS concentrates on the development of a knowledge base of the organization's collective experience and maintaining it up-to-date. In practice, it means that when a specialist creates a piece of knowledge during the process of dealing with an incident, but this knowledge has not yet been verified by anyone else, this knowledge is not trusted at this stage (*Draft stage*). When re-use of the knowledge occurs, the trust increases (by either approval or publishing the knowledge item). (KCS Practice Guide) Therefore, the knowledge base might include knowledge that is accessed at different stages of trust and visibility, which challenges the traditional belief that all knowledge in the knowledge base is perfect, validated, and highly trusted.

The last concept of KCS methodology focuses on rewarding learning, collaboration, sharing and improvements. It requires a change of culture of an organization in order to encourage behavior of collaboration, sharing, improvement and competent usage. It proclaims that support specialists need to be valued not for what they know, but rather for their ability to learn and help others. KCS methodology has been evolving for more than twenty years by now, it provides practical guidance on how companies can capture and reuse knowledge more effectively. KCS complements ITIL by providing practical guidance on implementation of its processes.

Next section discusses KM Maturity Model which was used for aiming at improving KM process in the case company by producing CC KM Maturity model to be used for current KM Maturity level estimation and as a guideline for moving case company applications towards higher KM Maturity levels.

4.3 KM Maturity Model

A Maturity Model approach can also be applied to the evaluation of Knowledge Management for the purpose of defining KM maturity levels of various applications. This approach was selected because the maturity model was applied for the analysis of the KM process maturity in the case company.

4.3.1 CMM Maturity Models

The maturity model was originally developed in 1986 by Software Engineering Institute (SEI), a research and development center sponsored by the U.S. Department of Defense, as a process maturity framework to improve a software process. After several years the model has evolved into the Capability Maturity Model (CMM) which has been designed for the purpose of selecting process improvement strategies by determining the current process maturity and identifying the most critical issues to improve software quality and process (Paulk et al. 1993: 19). The CMM is similar to the ISO 9001 series of standards, which concentrates on software development and maintenance, defining a framework for *continuous process improvement* and the means to accomplish that.

The CMM consists of a five steps path during which processes become increasingly organized and systematically more *mature*. *Mature* organization is described by Paulk et al. (1993) as an organization which possesses an organization-wide ability to manage development and maintenance; moreover, the following are mentioned to contribute to the maturity of an organization: *accurate* communication of processes*, consistency* between processes and actual work, work execution according to the *usable*, *predefined* and *up-to-date* processes*, monitoring of quality and processes* influencing it*, clear* roles and responsibilities, objective and quantitative basis for judging of product quality and problems related to products and process, realistic and based on experience schedules and budgets and usually kept expected results. On a general level, the process is kept under discipline and is consistently followed as all parties understand *the value* which doing so brings; also, there is an infrastructure to provide the support for the process. The figure 14 below overviews the five levels of software process maturity.

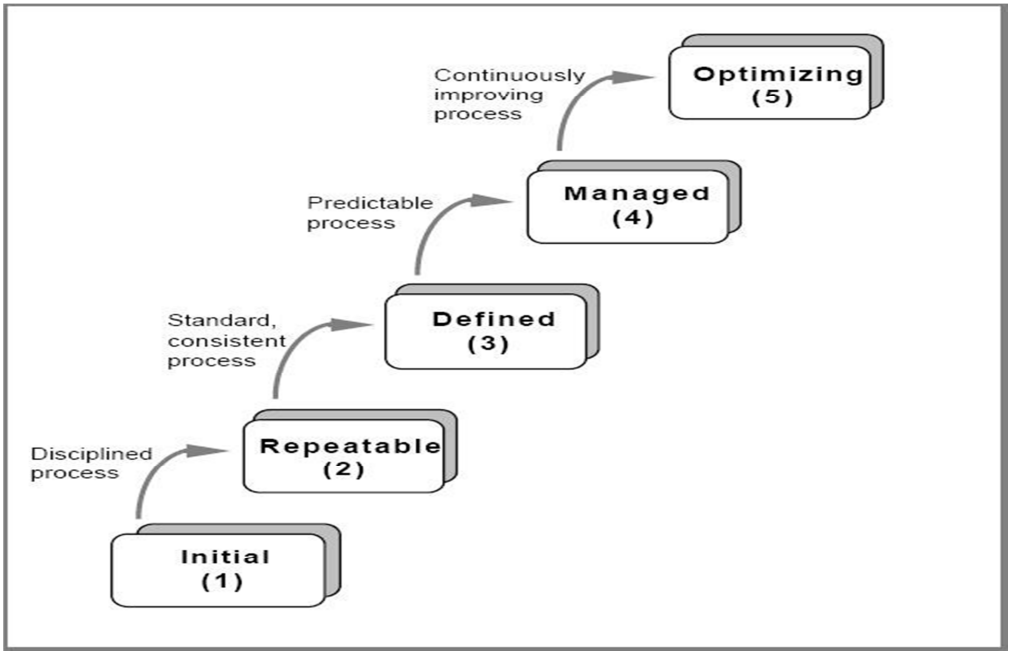

Figure 14. The Five Levels of Software Process Maturity (Adopted from: Hendershott Consulting)

At the *initial* level of the model, processes are mostly undefined, disorganized, and happen on ad-hoc or chaotic basis. Any success at this stage is likely due to efforts of individuals. Processes are not repeatable at this stage because they are not sufficiently defined and documented to be replicated. At the next *repeatable* stage, the requisite processes are established, defined, and documented so that they can be repeated. On the third *defined* level, an organization has developed its own standard software process with all activities documented, standardized, and integrated into a standard software process for the organization. At the forth *managed* stage, the processes of an organization are monitored and controlled via *data collection* (detailed measures) and *analysis*. On the final *optimizing* level, company processes are constantly being improved through feedback from current processes and by introducing innovative ideas and technologies to better serve the organization's needs. (Paulk et al. 1993)

4.3.2 The APQC KM Maturity Model

The APQC KM Maturity Model received its mane from one of the world's leading research companies specializing in benchmarking, best practices, and knowledge management. APQC is member-based nonprofit organization with over 500 members from different industries. According to APQC (APQC web site), the information they provide to organizations enable organizations to work smarter, faster, and with greater confidence. APQC has won wide business recognition and multiple awards (e.g., the Most Admired Knowledge Enterprises (MAKE) award on

the global and regional levels (North America)). The APQC company has developed its own Maturity Model for Knowledge Management *(The APQC KM Maturity Model)* applied for the evaluation and improvement of the Knowledge Management process. The APQC Maturity Model was also applied by the case organization on this study.

The APQC KM Maturity Model has five levels through which knowledge is being developed from *ad-hoc knowledge* into the *dynamic knowledge,* as described in Figure 15 illustrating the structure of the APQC KM Maturity Model.

Figure 15. APQC KM Maturity Model. (Source: APQC Knowledge Management Capability Assessment Tool)

As seen in Figure 15, at the initial level one, the knowledge existing at this stage is random and *ad-hoc*, so that the main focus is placed on *growing awareness* about KM (Level 1). As the KM process matures to the next level, the KM-related practices become more *localized and repeatable* (Level 2). On the next maturity level, the KM process acquires *common approaches,* and the knowledge resulting from this process becomes more *applied knowledge* (Level 3). After that, the KM process develops a good ground for the process becoming *measured and adaptive*, and the knowledge resulting from it *leveraged* (Level 4). Finally, at the most mature KM level, the KM process develops practices for becoming *continuously improved* in an organization, and the knowledge accumulated in such a process becomes a truly *dynamic knowledge*.

Though Maturity model was originated for the purposes of software industry, it has and is still used as a reference model for a process maturity. The KM Maturity model developed by APQC has been used in this Study as a reference model (prototype) for creation of CC KM Maturity model which was later utilized in Pilots 1-2 (see Section 6).

5 Role of Knowledge Sharing in Knowledge Management and Incident Management

This section overviews discusses the main factors influencing knowledge management and especially sharing indicated in the available knowledge. It starts from the overview of the Knowledge Management cycle which shows the place of Knowledge sharing practices in the Knowledge Management process.

5.1 Knowledge Management Cycle

According to Jashapara (2004), Knowledge Management cycle comprises of the following stages: Discovering Knowledge, Generating Knowledge, Evaluating Knowledge, Sharing Knowledge and Leveraging Knowledge. As this research aims at improving Knowledge Management process as whole in the case company, all the aspects of Knowledge Management cycle are covered in the developed proposal (Section 7). Figure 16 overviews the Knowledge Management Cycle by Jashapara (2004).

Figure 16. Knowledge Management Cycle (Adopted from: Jashapara 2004).

5.2 Knowledge Sharing in Knowledge Management

An organization needs to share knowledge it possesses with people who need it in order to maintain existence. According to Andriessen (2006), Knowledge sharing stands for "facilitating learning, through sharing, into usable ideas, products and processes". While information is a collection of figures, facts, ect, knowledge is a personalized interpretation of the same which refers to a certain situation (Andriessen 2006).

As researchers stress, knowledge has little value if it is not managed (Otala 2008). However, people are noticed to like to share knowledge in form of ideas, solutions etc. verbally more than to put it into an organized for the purpose system (Huysman and Wit 2002).

According to Andriessen (2006), major *barriers* for knowledge sharing are lack of time, geographical distance, lacking abilities and cognitive distance. Successful knowledge sharing requires that its barriers are identified as identification of barriers may give one a better understanding of knowledge sharing behavior. In addition to these knowledge barriers, researchers also point to other factors such as cultural barriers, individual barriers and social barriers, which makes knowledge sharing a challenge for the participants in this process.

In contrast to knowledge sharing barriers, there are also factors facilitating knowledge sharing. The following factors are known to motivate knowledge sharing: personal growth, reputation, the moral value of sharing, relations with others and extrinsic rewards. In addition to these knowledge sharing stimulators, researchers also point to other factors such as: a) personal growth, b) reputation, c) moral value of sharing, d) relations, e) role of incentives (Andriessen 2006).

Incentives, for example, which are commonly referred to in the work environment, can be divided into two groups: tangible and less tangible. Tangible incentives are also referred to as hard rewards or rewards, and can be e.g. money, trip, gift, promotion, bonus, company shares, and access to information etc. Intangible incentives, also called soft rewards or recognition, are of non-monetary value, e.g. enhanced reputation, public praise, personal satisfaction etc.

Modern companies are implementing different kind of knowledge sharing rewarding schemes. Multiple companies reward employees who share and use knowledge by monetary incentives. However, the effectiveness of such rewards is argued not to last and using them may even stimulate undesired behavior such as promoting self-interested behavior, reduce intrinsic motivation etc. (Andriessen 2006) Global collaboration and knowledge sharing network of Siemens has demonstrated that when their knowledge sharing reward system has been changed from

rewarding knowledge contributors and re-users by tangible value goods to rewarding with expert statuses, a considerable decrease in knowledge sharing activities happened.

In the company called Chevron, knowledge management is embedded into work process by following metrics of knowledge sharing and reusing during employees' annual performance evaluation which are then used for career enhancing. In one case company knowledge sharing related hard rewards were not liked by many employees with one of arguments being that knowledge sharing should be part of the job. (Andriessen 2006)

According to the company APQC, knowledge sharing is tightly linked to the corporate culture leading to the fact that there is no single right solution fitting all companies as conditions are different. In general, soft rewards seems to work better in long term but are said not to be easy implemented. (Andriessen 2006)

5.3 Conceptual Framework of This Study

For the purposes of this study, this research has drawn from a range of sources of available knowledge and best practices focusing on several directions. First, the study needed to investigate bes6v practices from ITIL and other major IT process descriptions. Then, this vision was applied to the processes in the knowledge management from the knowledge management research. Finally, when all these approached were considered together, for the purposes of this study, the creating the improvement suggestions of the case company was grounded in the following approaches summarized in Table 5 below.

Table 5. The elements of theoretical ground of this study.

Element	*Purpose in this Study*
ITIL framework, incl. Incident Management and Knowledge Management	Used for understanding the structure of and Service Management's tasks.
KM Maturity model	Used for defining Knowledge Management maturity levels.
KCS methodology	Used for understanding practical best practices of Knowledge Management process implementation in support's work.
Knowledge Management	Used for understanding Knowledge Management cycle

Table 5 describes the components of the conceptual framework used as a starting point for developing the improvement suggestions for the case company in this research. As the case company is ITIL compliant, it follows the ITIL processes during its IT service lifecycle, from defining a business need all the way until the Continual Service Improvement stage. However, at the moment, ITIL lacks IT service lifecycle implementation details. Therefore, KCS methodology was utilized to complement ITIL in the way it offers a practical guideline for implementing Knowledge Management-related best practices. Additionally, the KM Maturity model was necessary to use for understanding the existing process maturity levels and further defining the knowledge maturity levels as targets for the case company development. Other Knowledge Management literature was used to understand different aspects of Knowledge Management cycle, especially in terms of KM sharing, which complements the needs for creating the improvement proposal in this study. A special role was played by the KM Maturity Model which facilitated later development of the improvement suggestions.

6 KM Maturity Model in the Case Company

This section describes the development of the case company KM Maturity Model for the evaluation of the KM process in the case company unit. This model was developed based on the best practices and available knowledge overviewed in Section 4 and the results of the current state analysis presented in Section 3.

6.1 Translation of the APQC KM Maturity Model to the Case Company KM Process

To create a maturity model for the case company, a team of three people including the researcher (a pilot team) from the AMU KM Core team, conducted Workshops 1-3 during which the team used the APQC KM Maturity Model as a prototype for the creation of the model for the evaluation of the case company KM process. It means the maturity levels of the APQC KM Maturity Model were interpreted for the tailored evaluation in the case company KM processes. In other words, the APQC KM levels were translated in terms of each KM maturity level expected behaviors, exit criteria to move to the next level, and related measurements.

To interpret and translate the APQC maturity levels to the needs of the case company, three workshops were held by the AMU Core team. During these workshops the following variables were chosen for the maturity level evaluations: participants' work experience, existing data from the case company, best practices such as the KCS methodology, and the best work-related practices. Table 6 below summarizes the features of the KM process characteristic of Stage 1 of the CC KM Maturity Model.

Table 6. Description of Stage 1 features in the CC KM Maturity Model.

Behaviors	Exit criteria	Measurements
Knowledge sharing happens on random bases and it is of informal form. There are no consistent processes or practices for identifying, capturing and sharing knowledge. Added value of KM is not commonly understood. KM training approach: training on the basic tool and process usage	-KM process and tool available -Main KM roles are recognized -Sponsorship for KM from Senior Management - KM value communicated - "KM basics" in place for a particular application	-Awareness, competence & coverage (assessed via survey) - "KM basics in place" analysis
Attitude: *I perceive KM as an extra effort on my side*	**Attitude:** *I understand KM can bring some benefits*	

As seem from Table 6, at the initial level (Stage 1) of the case company KM maturity model CC KM maturity model, the knowledge sharing is described as *random and informal* against *ad-hoc* in the APQC KM model. It means there were no established, consistent processes or practices for identifying, capturing and sharing knowledge. At this level, the value of Knowledge Management is not obvious and commonly understood by the users; therefore, KM is seen as an extra effort on their side.

As a result of Workshop 1, the pilot team suggested the following requirements should be met as a set of exit criteria from Stage 1: a) the KM process and tool trainings have been attended by the users; b) the main KM roles are known; c) senior management is providing their sponsorship for KM; d) the KM value has been communicated in the organization in a compelling way, and e) the KM basic articles have been created for each application. After this stage, the attitude of employees has changed to a statement: "I understand KM can bring some benefits". In order to indicate the move to Stage 2, the awareness, competence and coverage levels of KM need to be measured. Such measurements can be done, for example, via a survey. Table 7 below summarizes the features of the KM process characteristic of Stage 2 of the CC KM Maturity Model.

Table 7. Description of Stage 2 features in the CC KM Maturity Model.

Behaviors	**Exit criteria**	**Measurements**
-Senior Management support cascades downwards. - KM early adapters are practicing KM by content creation. -There are initiatives in the organization to ignite KM followers by repeated KM centric messag-es, trainings, objectives, recogni-tion. -KM tool and process trainings can be requested on demand basis.	-KM common goals exist in the organization. -KM followers join KM early adapters in content creation which results in the increase of new KM articles.	-AMU KM Volume Growth report to be followed.
Attitude: I know what KM is about.	**Attitude:** *I am using or should be using KM.*	

As seen from Table 7, Stage 2 of the CC KM Maturity Model was described by the pilot team as characterized by the following criteria: a) senior management's buying in is cascading down meaning that their agreement to support KM has passed down to the lower organizational lev-

els until the actual knowledge workers (AMU support specialists); b) early KM adapters are creating KM content meaning KM articles; and c) some KM-related initiatives (e.g., repeated communication, trainings, recognition of objectives, and similar initiatives) are implemented to ignite KM followers. At Stage 2, the attitude of the majority of users towards KM can be characterized by a statement: "I know what KM is about". Followers start joining early adapters in KM content creation, demonstrated as an increase in the number of KM articles per each application. The attitude of people started changing to: "I am using or should be using KM". Exit criteria for Stage 2 of the CC KM Maturity Model include: a) a KM training package (for both the KM process and the KM tool), and b) the users' awareness of the common KM goals. As the measurements for this stage, several variables can be suggested: a) to follow closely the number of KM articles created per application, b) the number of views per KM article, c) users' ratings of a KM article, and similar useful measurements reported in the internal *KM Volume Growth report*. Table 8 below summarizes the features of the KM process characteristic of Stage 3 of the CC KM Maturity Model.

Table 8. Description of Stage 3 features in the CC KM Maturity Model.

Behaviors	**Exit criteria**	**Measurements**
-Designing and implementing of pilot initiatives is happening: e.g. application level KM strategy - Focused KM training can be requested, e.g. training on tools, roles and processes targeted for certain audiences. -Within the organization, variation in KM maturity level becomes visible: more systematic KM approach in certain areas/applications than in others.	-Metrics to be followed up exist. -General KM approach changes from one-size-fits-all to e.g. application specific initiatives. -KM lessons learnt are captured and utilized. -KM is present on agenda in application related meetings. -Understanding of importance of knowledge quality is growing.	-AMU KM Volume Growth report to be followed. -Knowledge Base Utilization Rate report to be followed.
Attitude: *I am creating knowledge articles but may not be doing KM efficiently.*	**Attitude:** *I create quality knowledge articles and use them for tickets resolution.*	

As seen from Table 8, at Stage 3 of the CC KM maturity, due to the applications being different, *an application specific Knowledge Management strategy* needs to be introduced. Such a strategy needs to be designed and implemented for each particular application. Later on, lessons

learnt are to be captured in the AMU KM strategy guidebook. At this stage, KM is supposed to be present on the agenda in application production meetings, and a general understanding about the importance of knowledge accumulating and sharing should be growing. At this stage, KM training is developed for certain (targeted) audiences (as for the KM tools, roles and processes).

The users' attitude towards KM can be characterized by a statement: "I am creating KM articles but might not be using KM efficiently". As a suggested measurement for this stage, the following variable from the KM Volume Growth report and KB utilization rate can be suggested - the frequency of the articles being used to resolve tickets. As an exit criterion to Stage 4, the evidence of the growing quality of the KM articles created by the users can be suggested; they create KM articles of high quality and use them for ticket resolution. The features for Stage 2 of the CC KM Maturity Model are listed in Appendix 2. Table 9 below summarizes the features of the KM process characteristic of Stage 4 of the CC KM Maturity Model.

Table 9. Description of Stage 4 features in the CC KM Maturity Model.

Behaviors	**Exit criteria**	**Measurements**
- Overall buy in for KM: added value of KM is commonly recognized. - Consistent quality of KM articles (naming conventions, lay out, content criteria) - Full understanding on search capabilities & use to understand user behavior and their needs. - Dialogue with users on their KM needs -Benchmark with other companies	- AMU KM roadmap in place -KM is naturally integrated in daily work. - KM communities unite different teams/ units/ organizations (no silos). KM is a joint way of working. - The quality of content is measured (sampling) - Continuous Improvement Process loop implemented	- AMU KM Volume Growth report - Knowledge Base Utilization Rate report -Solution Quality Index standard (to be decided what it consists of)
Attitude: *I experience the benefits of KM. Our resolution times have dropped and users are able to solve problems by themselves.*	**Attitude:** *Of course we use KM! Strange that you even ask!*	

At Stage 4 of the CC KM maturity, the value of KM started to be commonly recognized. Newly created KM articles are of consistently better quality in terms of their layout and content, and following the naming convention. The users creating KM articles have full understanding of the

KM database search capabilities, which helps to understand users' behavior and their needs. There is an ongoing dialog between the application support and the applications Key users about the latter's needs. The attitude of users can be characterized be a statement: "I experience the benefits of using KM, for many people involved such as application's (Key) users, colleagues, and product team". The tickets resolution times have dropped, and the users are able to solve problems by themselves by utilizing the Knowledge base.

As en exit criteria from Stage 4 to Stage 5, a criterion of using KM as part of the users' daily work can be suggested. KM becomes a joint way of working for different but related teams and units, and there is no room for silos. On part of the support team, there is an ongoing random quality sampling of KM articles, and Continuous Improvement Process loop (KCS) is being fully implemented at this stage. The AMU KM Volume Growth, the KB Utilization Rate, and a new report - the Solution Quality Index standard (to be decided what it consists of) are used at this stage as the measurements of the KM process.

Table 10 below summarizes the features of the KM process characteristic of Stage 5 of the CC KM Maturity Model.

Table 10. Description of Stage 5 features in the CC KM Maturity Model.

Behaviors	Exit criteria	Measurements
-From fact based (short term, simplistic view) decision making to knowledge driven (long term, complex view) decision making (e.g. on resources, business process optimization, application improvement) -KM is seen as a key asset and delivering competitive advantage -Expanding KM scope: besides problem-solution articles (exact matches), KM also used for learning process & direct thinking in complex matters	-KM as part of Continual Service Improvement (KCS methodology) (evolving guidebooks, lessons learnt, best practice sharing) and integral part of Service Strategy.	- AMU KM Volume Growth report - Knowledge Base Utilization Rate report -Solution Quality Index standard (to be decided what it consists of)
Attitude: *I am proud to present how we use KM to other companies*	**Attitude:** *We are recognized as a true KM role model to other organizations*	

Finally, at Stage 5 of the CC KM maturity, the streamlined KM process becomes a key asset giving the case company a completive advantage. It helps moving from an assumption-based (short term, simplistic view) decision-making to a knowledge-driven (long term, complex view) decision-making (e.g., based on knowledge of the resources and business process optimization). At this stage, the KM scope is expanding in the case company: KM functionality is not only used for finding knowledge for problem solutions but also for learning and direct application in complex matters. Attitude of the users can be characterized by the following statement: "I am proud to present how we use KM to other companies". The main feature of this stage is that KM becomes part of Continual Service Improvement (KCS methodology) with evolving guidebooks, lessons learnt, best practices sharing and is an integral part of a Service Strategy. The attitude of the AMU specialists have also changed to: "We are recognized as a true KM role model for other organizations". At this final stage, the following KM measurements are used: a) the AMU KM Volume Growth, b) the KB Utilization Rate, and c) the Solution Quality Index Enhanced (to be decided what it consists of).

Additionally, for the purposes of better adjustment of the CC KM Maturity model to the case company needs, *Stage 0* of the KM maturity level was also defined. This is a stage at which new applications are when taken under the AMU scope.

APQC KM Maturity model has been interpreted for the purpose of its further utilization in the two AMU wide pilots (Pilots 1-2). As has been demonstrated in this section, the developed CC KM Maturity model has been developed in such way that KM is being matured through Stages 0-5 with the Stage 0 meaning no KM process established until KM maturity reaches Stage 5 when there is place for innovation and people are proud of working with KM.

The CC KM Maturity Model developed by the pilot team is illustrated in Figure 17.

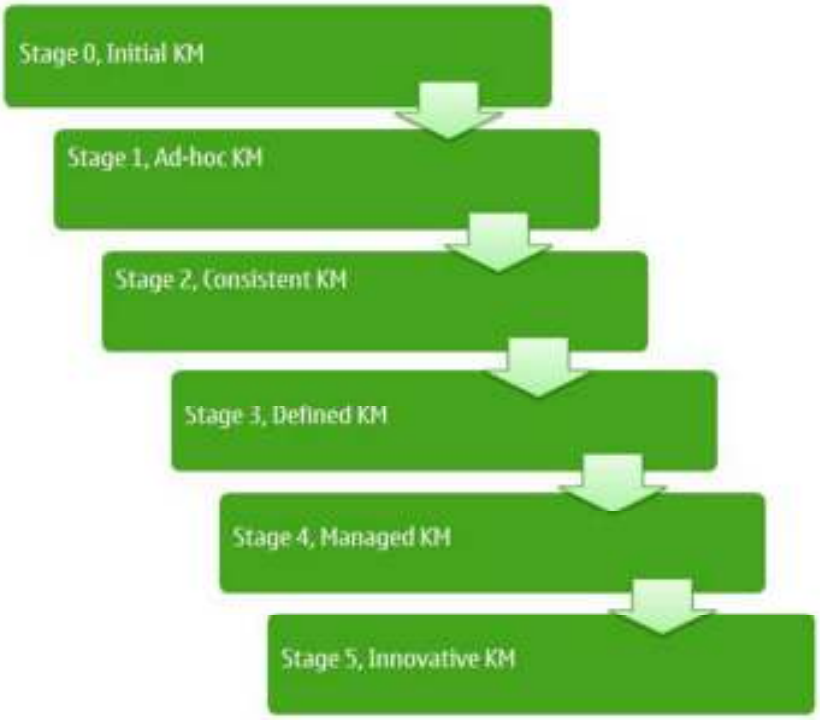

Figure 17. The CC KM Maturity Model.

As seen in Figure 17, the CC KM Maturity model has been designed so that knowledge matures through Stages 1-5. To apply the developed CC KM Maturity Model, two applications were selected for the pilots (Pilots 1 and 2, discussed in Section 6.2). During the pilots, firstly, the current CC KM maturity level of the pilot applications was evaluated. Then, by applying next CC KM Maturity model stage's KM actions, pilot applications were moved to the highest CC KM maturity level possible during pilots' duration. The purpose of the pilots, which lasted for approximately five months, was to understand KM situation within the unit, and record lessons learnt which would be utilized in the future for the similar type of AMU applications.

The results of Pilots 1 and 2 are overviewed in the next sub-sections.

6.2 Results from Pilots 1-2

After the CC KM maturity levels were defined, two pilots (Pilots 1-2) were executed to access the current KM maturity level of two different applications and then move these applications to the highest CC KM maturity level possible. Originally five applications in AMU scope were planned to execute pilot upon, however, due to the case company reorganization, the planned pilots were executed on two applications only (Application 1 and 2). The ultimate goal of the pilots was to draw conclusions and based on them record lessons learned and recommendations on how to better utilize KM.

6.2.1 Results of Pilot 1

This pilot (Pilot 1) was planned to first, evaluate the current CC KM maturity level of Application 1 and, second to move that application to the highest CC KM Maturity model's stage possible. The Application 1 was the application recently taken under the scope of AMU at the time. At the time of the pilot implementation, the application in question had about one hundred internal users and eight Key users, all located in the EMEA region. The application was out-of-the-box solution, meaning that it has not been customized at all for the company needs. Application 1 support was provided at two levels: Level-2 and Level-3 respectively, both provided by company internal personnel.

As Application 1 was new to AMU, Knowledge base was to be built from scratch. From the KM point of view, the pilot starting point for this application was the CC KM maturity Stage 0, and the goal of it was to reach CC KM Maturity stage three.

In order to reach CC KM Maturity Stage 1, the foundation of the Knowledge base for the Application 1 ("KM Basics") was created. Also, in order to create KM *awareness* (Stage 1), a meeting with application Key users was organized, and discussions about KM with the application team were conducted during the pilot.

Next, in order to reach CC KM Maturity Stage 2, AMU KM Volume Growth report was reviewed for the application. Additionally, existing ITSM tickets were analyzed to check if new Knowledge Article(s) could be created to tackle re-occurring questions/inquiries; and to further enhance awareness, a review and an update of the existing Knowledge Articles with the application team was done where necessary. Also, meeting and training session were held for the Key users on how to use IT Self Help. Next, the Application 1 KM Scorecard was created where these met-

rics were decided to be followed on a monthly basis, namely: a) the KM Volume Growth report (to understand the trend of new Knowledge Articles), b) the KM Utilization Rate report (to understand the number of ITSM tickets for which an existing Knowledge Article has been used as a solution), and c) the KM Search History report (to identify the most frequently used search words in order to relate them to the existing Knowledge articles with the intention of creating new ones/maintaining existing once) so that later on relevant action planning, and its implementation can happen. Finally, quality check was executed for the existing Knowledge articles.

Even though many actions were implemented, the application did not reach the CC KM Maturity Stage 3 mainly due the following reasons: application level KM strategy was missing at this stage, and also KM is not yet present on agenda in application related meetings. Worth of mentioning, there were certain time constrains and organizational restructuring ongoing at the case company unit at the time which had an impact on the Pilot 1-2.

6.2.2 Results of Pilot 2

Pilot 2 was implemented on the second application which was an application, being already utilized in the case company, with over 20 000 number of users and multiple integrations supporting different functionalities. Application support for this application was provided at two levels: Level-2 and Level-3, the former maintained by the internal company employees divided into three support regions to provide Follow-the-sun support mode; while the latter was provided by an external operator. The pilot starting point for this application was the KM maturity Level 2 and the pilot goal was to reach the KM maturity Level 4.

To reach Level 3, first, the missing Knowledge Articles were created under the initiative "KM Basics in Place" for this application. Second, during this stage, the misaligning in Knowledge articles naming was identified and addressed. The misnaming occurred due to the fact that the Knowledge articles were created in three different support regions. The issue was decided to resolve by agreeing on the same naming format, and articles were renamed accordingly to the decision. Third, a need to create a process to unify application KM across the support regions was identified, as one of the support regions was creating knowledge articles for their purpose only (mainly since they had it as a personal development target), and no cross checking existed for suitability of the articles for support in other regions. Additionally, no communication about new Knowledge Articles has been sent to other regions support teams as a means to raise KM awareness among all support regions by gathering all application-related knowledge article details (including those unpublished, too) into one location. Fourth, Survey 4 was run for the Pilot 2 application support team to understand current Knowledge Management process and to identify whether Knowledge articles are used for ITSM tickets resolution. The total number of

answers was four, two from the APAC, one from the EMEA region, and one from the AMERICAS support regions. Survey answers indicated that the respondents seldom or never used Knowledge articles for tickets resolution. The respondents named the following reason for it:

> *Last status was, that I shouldn´t use them* (EMEA)
> *It is not easy to find one article suit for the issue* (APAC)
> *In the process of building up the Knowledge base articles* (APAC)
> *I'll search KM when help is needed* (APAC)

All the respondents agreed that using knowledge articles would speed up incident resolution when handling the tickets. The following factors were mentioned which respondents cited which would facilitate the faster tickets resolution:

> *Create more articles* (APAC)
> *Specific Knowledgebase articles have to be created or modified in a condition that can address specific incidents* (APAC)

Answering the question if their support region currently had a process for Knowledge Base articles to be created, two respondents answered *"yes",* one answered *"no"* and one *"I don't know"*. Additionally, only one respondent was able to name the person responsible for KM from their support region.

Among other features missing in the KM process for this application, the application specific KM strategy was missing for this application (CC KM Maturity Stage 3). Additionally, the KM process was never discussed in production meetings, and the appropriate measurements were not followed for this application in any of the three regions.

Overall, the conclusion from the Pilot 2 was that, after all the improvement efforts mentioned this application did not yet reach the KM maturity Level 3 as many important KM criterions have not been fulfilled (such as the missing KM strategy; the KM process not being discussed in production meetings; and the appropriate measurements were not followed).

As the additional suggestions on how move this application to the next maturity stage (CC KM Maturity Stage 3) were: implementing application level KM strategy and taking KM as a part of application meeting's agenda. Regarding moving this application to the maturity stage CC KM Maturity Stage 4, first the Application KM Scorecard was suggested to be created to measure the progress by its metrics similarly to the application of the Pilot 1. Second, a regular knowledge sharing of tickets resolution among all the support regions was considered benefi-

cial. Third, it was also agreed that the analysis of ITSM tickets needs to be performed regularly in order to identify the subjects for new knowledge articles to be created or the existing ones to be maintained.

Summing up, the CC KM model was produced for the diagnostic purposes to help in improving the KM process in the AMU. It was applied in two Pilots to try the evaluation and improvements for the existing KM process. Additionally, this CC KM Maturity Model can also be used in the case organization for other AMU applications to identify their current KM Maturity stage, understand and implement actions in order to achieve higher KM Maturity levels. All the appropriate notes, feedback, ideas and comments received from Pilot 1-2 were taken into account when the initial proposal was produced. To further improve the KM process, the needs and suggestions are analyzed in the next section. After that, a proposal for further improvements is suggested in Section 7.2.

Additionally, after conducting Survey 2, the AMU KM core team (including the researcher) identified that each application in the AMU scope should have three KM articles (describing a functionality of an application, its support model and the information about its access rights, which all were identified as primary but vital knowledge about any application) in Knowledge Base. After the decision has been made, the team has conducted the "KM Basics in Place" exercise to create such Knowledge articles for the critical applications in the AMU scope. When this *vital* information can be found in Knowledge Base, it has the following impact on the Incident Management: a) users might resolve their queries, questions etc. by themselves by finding the answer from the Knowledge Base so that ITSM ticket *deflection* will happen; b) users may find answers to their questions and therefore act correctly, e.g. by using correct support channel to resolve their issue (without writing a question to the Service Desk first), so that the resolution of the issue happens faster; c) Service Desk analysts will have correct information in case users did not use /find the information from Knowledge base and channelize it also correctly. This will also help to speed up the process of ticket resolution.

7 Analysis and Development of the Proposal for the Improved KM Management Process in the Case Company

This section presents the analysis of users' needs and suggestions. Additionally, it overviews the initial proposal for the improved KM process for the case company unit which is later verified and the final proposal is presented.

7.1 Challenges and Suggestions for Improvements

The users' needs and suggestions were collected throughout the data collection processes. They are summarized and presented according to the source they were gathered from.

7.1.1 Challenges and Suggestions for Improvements from Surveys 1-3 and 4

Improvement suggestion 1. Developing KM plan on application level

> *"There is no clear plan on KM utilization in our application area - due to some personal incentives targets set across the teams in second half, there has been entries put in simply to match these targets, but not paying attention to the actual content (copy/pasting content from other tools is not effective and intended use of KM in my opinion), and how it going to be used (and by whom). KM utilization needs to be driven on the application level, as the approach (incl. what and how, and to whom) differs from application to application a lot".* (Survey 1)

Improvement suggestion 2. Requirement of creating a Knowledge article as a part of resolving ITSM ticket to ensure there is an article tackling each issue /query /question

> *"I think it should be directly tied to the resolution on the ITSM Incident ticket .. therefore requiring" …."you to enter information into KM at the time of resolution".* (Survey 1)

Improvement suggestion 3. Grouping Knowledge articles according to product name so that they are found easier

> *"The knowledge in there (ITSM KM) should be grouped according to different tools".* (Survey 1)
> *"We can query it by product categorization, such as Application 1, Application 2".* (Survey 2)

Improvement suggestion 4. Enabling easier Knowledge articles creation

a) prepopulating of Knowledge article fields

"All users can set a default value for create KM, because everyone works in a specific area, so we don't need type so much when i create km". "The approval

process should be changed so that the originator does not need to know whom to assign the article".

"Also the area / content specific rights would make it easier to find a relevant approver. Now you get whole company to choose from". (Survey 2)

b) enabling more uniform Knowledge articles

"There should be a defined set of documents that should be published in KM for each application so that the information is uniform and you are able to quickly locate what you need". (Survey 2)

Improvement suggestion 5. Ensuring Knowledge articles are up-to-date

"Are articles properly maintained as time goes on and processes / information / products change?" (Survey 2)

Improvement suggestion 6. Promotion of KM tool added value

"Promoting more awareness in the bottom team level to reach the individuals will increase the usage". (Survey 2)

As can be seen from the samples of data, KCS recommends implementing knowledge creation and Incident Management simultaneously which is exactly what has been brought up in the Improvement suggestion 2. Currently, in the ITSM KM, there is an option for creating a Knowledge article when dealing with an ITSM ticket. However, presently it is an *optional* step. Requiring creating a Knowledge article when solving an ITSM ticket (or linking an existing Knowledge article as a resolution for an ITSM ticket) would have the following impact on the KM process and Incident Management: a) Knowledge base is searched for a possible solution which means support specialists stay up-to-date about existing knowledge in Knowledge base. In case the searched item is found, it is linked as a solution to the ITSM ticket. In case the solution to the issue described in ITSM ticket does not exist in form of a Knowledge article, it must be created and updated along the handling ticket time. Thus, the following is ensured: a) the knowledge is preserved in the Knowledge base, b) knowledge is not held within support specialists as opposed to the current problem described in Section 3.2.2. Finding 4 part.

In the open comments in Survey 2, there was an important suggestion made about setting an application level (or group of similar applications) KM plan. It was stated that as AMU applications were different, the same KM strategy for all AMU applications would not be sufficient and therefore should be avoided. Thus, the AM Knowledge Management core team decided to conduct Pilots 1-2 on several different types of applications under the AMU supervision to investigate the KM maturity level of the current applications and, by implementing certain types of KM related actions, to move them to the highest KM maturity level possible.

The conclusions from Surveys 1-2, which pursued a diagnostic purpose, identified the KM-related problems in the case company and diagnosed that: a) Knowledge Management process in AMU needs to be developed so that it would better support the AMU Incident Management, and b) these improvements should be made in terms of reducing the incidents resolution times and deflection of incidents.

Moreover in the Survey 4, all respondents agreed that using Knowledge articles when handling ITSM tickets would speed their resolution, however they identified that they seldom or never used Knowledge articles for ITSM tickets resolution due to the following reasons: a) Knowledge articles of this application is not up-to-date in Knowledge base, and b) they were told not to use the functionality. Also, respondents have expressed that faster ITSM tickets resolution can occur in case: a) more Knowledge articles are created, and b) specific Knowledge articles are created or existing articles are modified to address specific cases. To the question if the respondent's support region currently had a process for Knowledge articles to be created, two respondents from APAC region answered "Yes", one "No", and a respondent from EMEA region answered "I don't know ".

Finally, Survey 4 pointed to the gaps in the Knowledge Management process on a single application level (Pilot 2 application) such as, among others, knowledge being not created on systematic basis, Knowledge articles being not used for ITSM tickets resolution which would make ticket resolution faster, Knowledge articles being outdated in the Knowledge base, support specialists being not confident about the current process of Knowledge Management and particularly, Knowledge articles creation.

7.1.2 Challenges and Suggestions for Improvements from Pilots 1-2

Results of the **Pilots** 1-2 were used not only for detecting problems in the KM process (in Section 3, Current State Analysis), but also for collecting needs of the applications' users and their suggestions for improvements to be used for further KM process improvements.

During the Pilots 1-2, the following problem areas were identified: first, the biggest issue in the Knowledge Management process is that knowledge is not created on regular basis but randomly (personal development targets set among other reasons). Second, lack of unified Knowledge articles' naming among AMU and particularly Pilot 2 application's three support regions (APAC, EMEA and Americas) was identified as a problem area, which might result in knowledge been not found or been not found easily. Next, lack of cross-checking for new Knowledge articles

suitability for other support regions has been recognized as a potential problem. One of the regions has been creating Knowledge articles and marking them with the region name, which might lead users and support specialists to misunderstanding that articles are suitable for that region only and thus can be also a source of duplicate work from other regions support point of view. Third, lack of communication between the regions, among other topics, about new Knowledge articles and knowledge sharing about resolving ITSM tickets was recognized as another challenge area as it has an impact on Incident Management in terms of how fast ITSM tickets can be resolved. Next, it was considered as a necessity to have a central location to store information about the existing Knowledge articles and those once which are being written at the moment, with the intention to avoid duplicate work from other support regions and increase the support specialists' efficiency.

Finally, worth mentioning is the fact that the intention was to execute also Pilot 3-5 on different type of AMU applications to get more diverse input for the Knowledge Management process improvement, but unfortunately these plans were not implemented due to the latest company restructuring.

7.1.3 Summary of the Development Needs and Suggestions for the KM Process Improvement in the Case Company

It is of crucial importance, from the KM initiative success point of view, to ensure that there is a strong business need for the improvements, and their benefits are understood and embraced in the organization. Equally important is that there is commitment and full support from those working for IT Service Management. Moreover, support analysts working with Incident Management (all support levels) have to understand the importance of their roles as they are the ones capturing IT Service Management data on a daily basis. Therefore, it is important that they record their actions so that their knowledge can be re-used. Also, measures of the successful KM process need to be visible to all those involved, for example, less time to support a service, to find information to resolve incidents. (ITIL 2007)

Even though KM is not so easy to measure, the value of knowledge to the organization *needs to be* determined so that later the value of KM can be compared with its costs. The benefits of effective Knowledge Management are, according to ITIL, are among others: lower incident resolution time influenced by having targeted support staff training, *relevant, maintained and accessible* Knowledge Base, quicker resolution of ITSM tickets and ticket resolution at lower support levels. Measurements of successful KM are: measurement of usage of Knowledge Base (measured by number of its accesses) and average time to find relevant information.

7.2 Building Proposal for the Improved KM Process

This section presents a proposal for developing an improved, from Incident Management point of view, KM process in the case organization unit. The proposal utilizes the conceptual framework developed in Section 4.5. When developing this proposal, the following were taken into account: results of Surveys 1-3, Survey 4, Pilots 1-2 and personal experience of the researcher working as a support specialist.

First, it is important to notice that the analyzed results also support the idea of, as suggested in Survey 2, developing a Knowledge Management strategy on the application level, as opposed to the current case company unit level Knowledge Management strategy. Developing a KM strategy on the AMU application level (or the group of similar applications) would support the fact that the scope of applications supported by AMU is big, and these applications are different (for example, by their functionality, support and model composition). According to ITIL, other level KM strategy needs to fit with the organizational level KM initiative. The KM strategy *needs to cover* the following: the governance model, roles and responsibilities, funding, policies, *processes, procedures and methods,* technology and other resource requirements, and *performance results.* (ITIL 2007)

The proposal below is a set of practical actions suggested for the case organization which helps developing an application level KM strategy. The suggested actions are divided into entities of Knowledge Management cycle, as presented by Jashapara (2004: 5),: discovering knowledge, generating knowledge, evaluation knowledge, sharing knowledge and leveraging knowledge.

7.2.1 Discovering Knowledge

According to ITIL, knowledge needs to be accumulated from processes and workflow so that new knowledge is generated. In the AMU case, new knowledge is to be discovered from the Incident Management process (dealing with ITSM tickets) and related processes. It must be identified what knowledge is *relevant;* in the case company unit case, what knowledge is relevant from an application and its stakeholders point of view. Therefore, *application stakeholders* need to be identified as they vary from an application to another, to name a few, application end users, application Key users, product team, and other related support teams. The means for the identification of stakeholders' knowledge needs is the systematic dialog with them. (ITIL 2007)

7.2.2 Generating Knowledge

According to KCS methodology, the most efficient way to generate knowledge is to create Knowledge articles at the same time when dealing with problems (ITSM tickets); and make the articles visible to others immediately containing the information available at that moment (even not written completely). This way support organizations eliminate the duplicate work that the same problem has been/is being tackled by other support specialist. Creation of Knowledge articles afterwards is, according to KCS, expensive, slow and will result in losing the important elements of context occurred meanwhile interacting with the customer. Relevance of information is subject of judgment of a support specialist dealing with a ticket. (KCS Practices Guide).

Figure 18 below presents changed Incident Management process which can occur simultaneously with the Knowledge Management process, as opposed to the current situation where two processes are disconnected from each other.

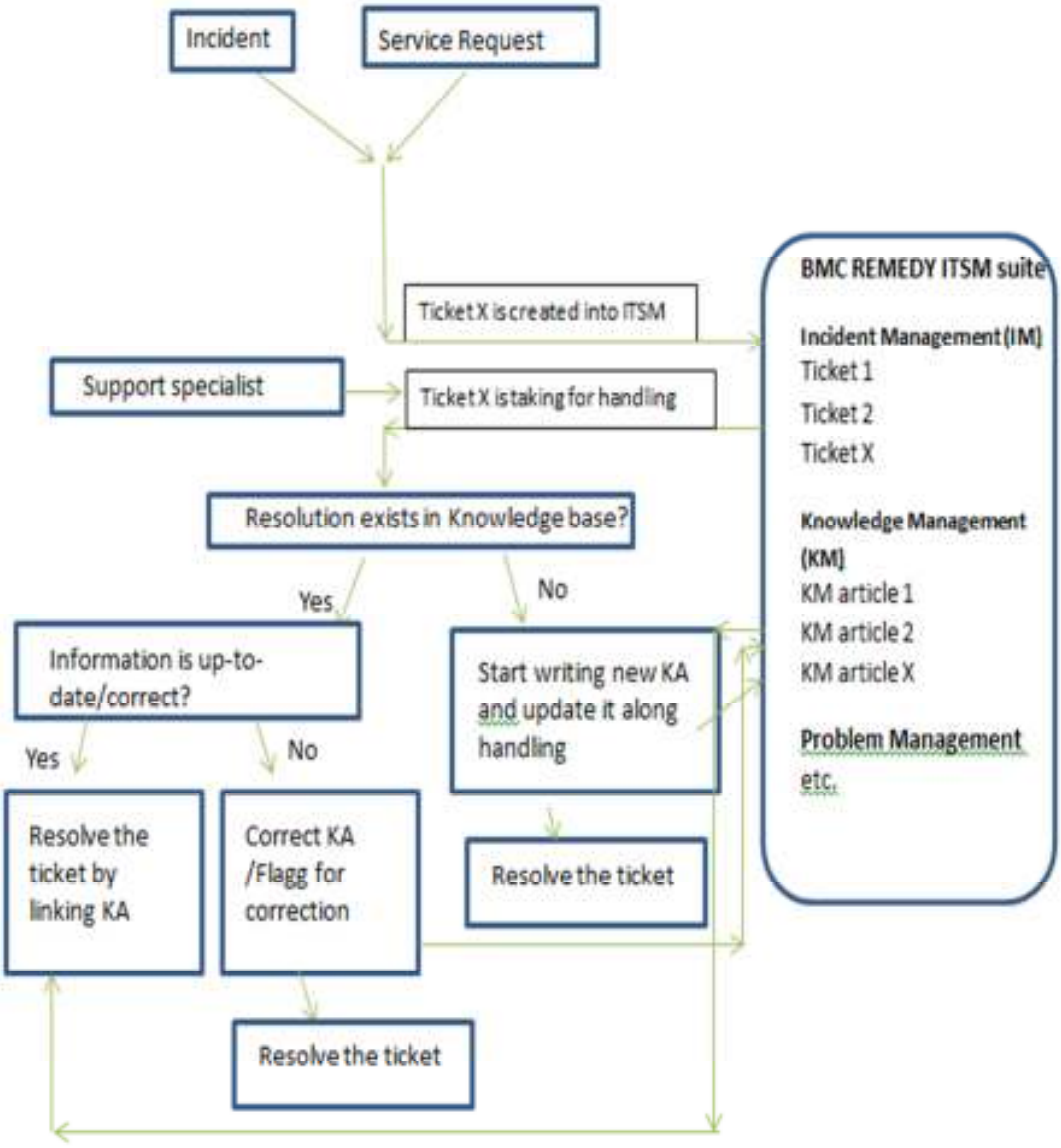

Figure 18. New process proposed for integrating Knowledge Management into Incident Management.

As Figure 18 point out, when ITSM ticket has been taken for handling by a support specialist, he/she needs first to review Knowledge base to verify whether a Knowledge article describing the same issue exist to resolve the ticket, in case it is found, support specialist needs to verify if the information in the Knowledge article is correct and up-to-date, in case of positive the ticket is resolved; otherwise, the Knowledge article needs to be corrected. Knowledge article correction is done ether by the support specialst him/hersef or it needs to be flagged for correction by another competent specialist. Once the correction is done, the ticket is resolved. If the issue described in in ITSM ticket is a new one (no Knowledge article existing), the support specialist

needs to start writing a new Knowledge article, publish it immediately and update it along the ticket's handling.

During the execution of the Pilots 1, it was identified that for the foundation of application Knowledge base, creation of three "basic" knowledge articles about an application should be made mandatory, from the Incident Management point of view, making possible deflection of ITSM tickets or reducing ticket resolution time.

Another important aspect of knowledge generation which has been proved as beneficial during Pilot 1, is "Reuse" concept of KCS methodology. It means using words and phrases which were used by users when searching for a Knowledge article for the creation of new Knowledge articles; the case company has readymade KM Search History Report which needs to be utilized for this purpose. Therefore, a regular review of the search words and phrases followed by creation of new Knowledge articles is important from Incident Management success point of view.

7.2.3 Evaluating Knowledge

According to KCS, existing Knowledge articles should not be reviewed, for the purpose of improvement, on random basis but when using them. Practically, it means that when a support specialist reviews Knowledge base and sees a Knowledge article which information is incorrect or which he/she does not understand, he/she is responsible for either correcting the article or flagging it for further correction. This way Knowledge base will be constantly maintained and costs related to Knowledge base maintenance will be smaller than when Knowledge articles are reviewed on some other basis.

Quality monitoring

To access and maintain the quality of Knowledge articles, KCS recommends having regular knowledge sampling. In the beginning of this initiative, it is worth of having more frequent reviews, for example, on a weekly basis with some basic criterion for articles' quality. When the process gets maturer, the review will be needed on less frequent basis with more demanding than in the beginning articles quality criteria, such as, for example, ticket documentation, handling, technical accuracy, problem solving process, customer interaction. (KCS Practices Guide)

7.2.4 Sharing Knowledge

According to ITIL, as people learn in different ways, the best method of transferring and maintaining knowledge within the Service Management and user community *need to be formed* in

various ways. It *may be recommended* to use regular communication channels such as newsletters, journals for incremental knowledge transfer so that new knowledge is absorbed easier; adding entertainment element and target grouping can be beneficial if needed. Using methods such as webinars, internet, intranet and discussion forums can help to question and develop knowledge. (ITIL 2007)

ITIL recommends having a single SKMS which can be shared, updated and used by all relevant parties across time zones and locations. Additionally, according to ITIL, a comprehensive SKMS needs to include the *Self-service* interface which provides users with possibility to access knowledge by themselves and which costs are much lower compared to the costs of assisted service (in this case AMU unit). At the moment, some offshore teams do not have an access to the Self-service for getting sufficient knowledge due to security reasons.

According to the feedback from Surveys 1-2, the process of Knowledge articles creation *needs to be simplified*, in terms of: a) pre-populating of some fields whenever possible to make knowledge creation process easier, for example, in the article reviewer field; b) create a simplified process guidance documentation. These little details can have big impact in terms of how fast knowledge is created and if created at all.

Important factors, from success of Knowledge Management point of view, is the proper knowledge transfer to the new support personnel, as well as regular knowledge sharing sessions among the support team members, different support regions and related teams to ensure the knowledge level stays up-to-date.

According to KCS, most of support organizations embrace individual contribution which promotes competition as opposed to the desired state: *collaboration.* Therefore, success of KCS implementation depends on if a company will be able to accomplish the shift in values: valuing employees not for what they know, but for their ability to learn and help others learn. (KCS Practices Guide: 14) *Meaningful* incentives for knowledge creation are to be defined, and as stated in the Section 5, knowledge sharing is tightly linked to the corporate culture so the company needs to think about what are the means to encourage employees to share their knowledge. Additionally, follow-up on KM incentives vs. KM outcomes is suggested to be done on regular defined basis.

7.2.5 Leveraging Knowledge

This phase corresponds to the highest level of CC KM Maturity model (Stage 5), meaning that when an organization reaches this KM maturity level, the knowledge is used, for knowledge

driven decision making regarding for example application improvement, business process- and resources optimization among others.

7.3 Initial Proposal: Action Plan

As the main business challenge for the case company is producing faster IT services in terms of enabling faster Incident Management (reducing of ITSM ticket resolution time and their possible deflection).

Table 11 below presents the list of proposed actions, from the Incident Management process efficiency point of view, which are based on the results of the data collection and analysis conducted in this study and described in Section 7.

Table 11. Summary of proposed actions to enable better KM process within AMU.

Action	*If not implemented, results in*	*If implemented, results in*
Requiring either linking existing KM article as a solution when resolving ITSM ticket or creating a new KM article	ITSM tickets generation	New Knowledge Articles creation Possible ITSM tickets deflection Knowledge gets shared in Knowledge base and be not locked within individuals Knowledge
Analysis of words and phrases used for search in Knowledge base	ITSM tickets generation	New Knowledge Articles creation Possible ITSM tickets deflection
"Basic" Knowledge Articles creation	ITSM tickets generation	Possible ITSM tickets deflection
Unification of Knowledge Articles structure, style and naming	ITSM tickets generation as information cannot be found easily	Possible ITSM tickets deflection
Definition of meaningful incentives for knowledge creation	Knowledge does not get shared in Knowledge base, users are not able to find needed information, new ITSM tickets generation	New Knowledge Articles creation Possible ITSM tickets deflection
Adding possible automation elements in Knowledge articles' creation process in ITSM KM	Knowledge does not get shared in Knowledge base OR the process will be delayed	Knowledge gets shared faster in ITSM KM, no bottlenecks in the process
Quality review of Knowledge articles	Out-dated/incorrect knowledge exist in Knowledge base which cannot be used for ITSM ticket resolution directly	Correct/up-to-date knowledge in the Knowledge base which can be used for ITSM ticket resolution directly

7.4 Validation of the Initial Proposal with Experts

The initial proposal presented in Section 7.3 has been reviewed with two interviewees (Interviewee 1, 2) who work as support specialists in the AMU. Interviewees were asked for their ideas and comments regarding the initial proposal in order to validate it and modify accordingly. This section overviews the comments of interviewees, several comments were received regarding the initial proposal.

Generally speaking, both interviewees agreed on that the proposal sounded good on general level. Moreover, both agreed that KM strategy on organization level is not sufficient and application level KM strategy is needed. Also, both indicated on that Change Management initiative required to implement the most fundamental (Integrating Knowledge Management into Incident Management) and other proposed actions requires management's ownership, commitment and accountability; also that implementation of the change would require a project with appropriate resources, budget and time frame. Interviewee 2 pointed out possible resistance for the change as possible obstacles to be aware of.

Interviewee 1 supported the idea of bringing Knowledge Management as part of Incident Management and indicated that in his point of view the two belong together. He also liked the idea presented in the proposal that KM would happen as a part of Incident Management and not as separated process which supports his point of view that KM should be inbuilt part of support functions. The last would require a change in culture in the case company.

7.5 Final Proposal

The final proposal was developed based on the comments received during validation interviews, Section 7.3. As can be seen from the appropriate section, no major changes to the proposal were suggested. The next table X overviews actions and their sub actions, proposed for the case company to enable faster Incident Management, in the priority order.

Table 12. Actions proposed for the case company.

Action
Integrating Knowledge Management into Incident Management • Implement Change Management process
Knowledge articles' quality review • Definition of meaningful incentives for knowledge creation
Unification of Knowledge articles structure, style and naming across the company
Adding possible automation elements in Knowledge articles' creation process
"Basic" Knowledge articles creation
Analysis of words and phrases used for search in Knowledge base
Grouping Knowledge articles according to the product/application name

Summing up, to improve the Knowledge Management process in the case organization unit in order to enhance Incident Management, it is recommended by the researcher that a) Knowledge Management is integrated into Incident Management b) Knowledge articles' quality is reviewed on regular basis, c) Knowledge articles' structure, style and naming is unified across the company, d) Knowledge articles' fields are prepopulated as much as possible, e) "Basic" Knowledge articles creation is done for all the applications, f) Analysis of words and phrases used for search in Knowledge base is implemented regularly and finally g) Knowledge articles are grouped according to the product/application name in the Knowledge base.

8 Discussion and Conclusions

This section overviews the results of the study and suggests managerial implication related to putting the proposal into action. It also discusses the reliability and validity issues addressed in this study.

8.1 Summary of the Study

Knowledge Management is an integral part of the work of IT service support personnel. Moreover, maintaining and sharing knowledge has direct influence on another process of IT Service Management, Incident Management. Knowledge Management influences Incident Management in the way that, if organized well, knowledge does not need to be rediscovered by support personnel and application users in some cases resolve their queries by finding the answers in Knowledge Base. This results in faster times for ITSM tickets resolution and possible deflection of tickets.

After BMC Remedy IT Service Management Suite was introduced in the case company, shortly after the case organization started to investigate, via surveys and pilots, the current use of the tool, and search for improvement areas in the existing Knowledge Management process which can positively affect Incident Management.

This Thesis accounts for these efforts and focuses on development of Knowledge Management in the case company in order to affect its Incident Management. It uses qualitative research methodology and action research as its main research approach. The theoretical part includes the review of available knowledge on Knowledge Management and best practices of IT Service Management, such as ITIL. The data are gathered from four surveys and two pilots conducted in the case company, based on which the initial version of the improvement proposal is produced. Later on the proposal is verified with the company experts and the final version of the proposal is produced according to their feedback.

The main challenges discovered in the existing Knowledge Management process in the case company unit (AMU, studied in this research) were: missing skills for using ITSM KM, Knowledge Management value being not understood, ITSM KM technical failures/limitations, concerns about protecting personal knowledge and knowledge being stored in multiple locations. These challenges were later proved in Pilots 1 and 2. The next actions to be taken to improve this process were developed in the initial proposal and, after verification, formulated into the final proposal. These improvement suggestions include: integrating Knowledge Management process into Incident Management process, Knowledge articles' quality review, unifica-

tion of Knowledge articles structure, style and naming across the company and adding possible automation elements in Knowledge articles' creation process.

The outcome of this Research is a proposal in form of a set of actions for an improved Knowledge Management process for the case company AMU unit. The improved process aims at enabling more efficient Incident Management process by shortening times for ITSM ticket resolution and deflecting some of the tickets.

8.2 Managerial Implications

This section overviews the managerial implications for the case company, which are based on the findings of this research. This study suggests the following actions which need to be taken in order to put the Proposal into practice.

Creating and putting into implementation the KM strategy on each application (or group of similar applications) proposed in this study will enable more efficient Incident Management process in terms of ITSM tickets faster resolution and their possible deflection. The most fundamental change to the current KM process stated in the proposal is the integration of Knowledge Management into Incident Management process. Implementation of this change and other actions influencing Incident Management process will require several actions from the case company management.

This big change will require careful planning, creation and implementation of Change Management initiative to change the mindset of support personnel. To achieve the target, a project should be established which the appropriate resources, budget, and schedule.

Consequently, commitment to support this initiative implementation should be provided so that employees feel that this initiative is not something nice to have but it is *a new way of working.* Practically, someone from the company management should be appointed to drive this initiative forward so that the initiative has a face, the ownership and accountability. Therefore, it is very important that communication about the change explaining its drivers (collective ownership of Knowledge base, continuous learning and more efficient knowledge sharing) will be flown properly to all levels until support specialists. Additionally, support specialists' line managers need to have face-to-face sessions with employees to communicate the new way of working to ensure it is understood and to minimize resistance by explaining the benefits.

Also as part of the change, regular reviews of Knowledge articles created by support specialists need to be maintained by the line managers to access articles' quality so that employees' per-

formance can be evaluated. Even though claimed that monetary rewards do not last and promote self-interested behavior (Andriessen 2006), personal experience of the researcher says that linking an incentive system to the Knowledge articles' quality measurements can be successful.

8.3 Reliability and Validity in This Study

Reliability and validity are ensured in this study be taking the following steps. First, this study provides an insight into knowledge management process in support organization which outcome is a proposal for more efficient KM process from Incident Management point of view as the two are interconnected. The study discovered that the two processes need to be concurrent and presents a set of actions to be implemented to enable more efficient Knowledge Management. Set of actions proposed can be used by the case organization to construct KM strategy on application level and not on organizational level as the current situation is.

Ensuring validity of this research has been done by discussing informally the subject of the study with employees working on different tasks within AMU. Additionally; the researcher herself works as support specialist in AMU, which gives her good understanding of the problems identified in Surveys 1-4 investigated as a part of material of this study. Naturally, some problems stated in the surveys can be subject to misinterpretation. The following have been also used to further ensure the validity of the study: different data sources- (interviewees working in different positions, for different applications and for different regions) and data collection utilization (surveys, literature and best practice review, researcher's and her colleagues' experience), and systematic recording of all the activities. During investigation of results of Surveys 1-4, and the Interviews 1-2, the key point was to avoid "Yes" and "No" type of questions so that richer data could be collected in terms of opinions, ideas, comments and recommendations. Additionally, feedback received during Interviews 1-2, increases validity of the study.

Reliability of this study has been ensured by choosing the appropriate, for addressing research question, research methodology so that appropriate research design could be constructed and implemented; and similarly appropriate research methods were used. Moreover, similar findings could be gained if the same methods were used.

References

Andriessen, E.J.H. (2006). *Conditions for the willingness to share knowledge*. Delft Innovation System Papers.

APQC website (n.d.). KM Maturity model. Available: <http://www.apqc.org/knowledge-management-frameworks> [Accessed 1 June 2011].

Blichfeldt, B.S. and Andersen, J.R. (2006). *Creating a Wider Audience for Action Research: Learning from Case-Study Research*. Journal of Research Practice. Vol. 2 (1), Article D2.

BMC Service Request Management portal, Available: <http://www.computerworld.jp/topics/569/101950> [Accessed 2 November 2011].

The Case Company Intranet (2013). [Accessed 4 January 2012].

Consortium for Service Innovation, KCS PRACTICES GUIDE (Version 5.3). Available: http://www.serviceinnovation.org/included/docs/kcs_practicesguide.pdf [Accessed 2 November 2011].

Easterby-Smith, M., Thorpe R. and Jackson P. *Management Research*. (3 ed), Sage Publications *Electronic Journal of Knowledge Management* (2010). Vol. 8 (1).

Forza, C. (2002). Survey research in operations management: a process-based perspective. *International Journal of Operations & Production Management*. Vol. 22 (2), 152 - 194.

Hendershott Consulting, Software Capability Maturity Model, Available from < http://hci-itil.com/processes/HCI_overview_maturity_frameworks.html> [Accessed 31 January 2013].

Huysman, M. and Wit, D. D. (2002). Knowledge Sharing in Practice. Dordrecht: Kluwer.

ITIL Official site, Available from <http://www.itil-officialsite.com> [Accessed 12 May 2012] Office of Government Commerce (2007) ITIL V3 Foundation Handbook.

Office of Government Commerce (2007). Service Operation. London: The Stationery Office.

Office of Government Commerce (2007). Service Transition. London: The Stationery Office.

Otala, L. (2008). *Osaamispääoman johtamisesta kilpailuetu*. WSOYpro, Helsinki.

Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods* (3 ed). Thosand Oaks: Sage Publications.

Paulk, M.C., Curtis, B., Chrisses, M., and Weber, C.V. (1993). Capability Maturity Model, Version 1.1, IEEE Software, 18-27.

Thyer, B.A. (2001). *The Handbook of Social Work Research Methods.* Sage Publications.

Yin, R.K. (2009). *Case Study Research* (4 ed). Sage Publications.

Appendix 1

Summary of the results: Workshop 1-3

Event	*Participants*	*Dates*	*Duration*	*Documents*	*Questions/topics/ brief descriptions*
Workshop 1	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	01.06.2011	1h	Memo and field notes	*Appendix 2* and *Section 6.2*
Workshop 2	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	27.06.2011	2h	Memo and field notes	*Appendix 1* and *Section 6.2*
Workshop 3	Application Support Specialist (Researcher), Line Manager 1, Line Manager 2	12.08.2011	2h	Memo and field notes	*Appendix 1* and *Section 6.2*

Topic of Workshop 1-3	Interpretation of the APQC KM Maturity Model to the case company needs, Levels 1-5
Outcome of Workshop 1-3	Creation of the Case Company KM Maturity Model (CC KM Maturity Model), Stages 1-5

Meeting log for Workshops 1-3

01.06.2012	Definition of Maturity levels, behaviors, exit criteria & measurements
27.06.2011	Behaviors of the KM Maturity model have been interpreted
12.08.2011	KM Maturity Model 'must have' criteria identified, Interpretation of exit criteria into checklist/assessment (concrete questions) cancelled due to time restrictions

Appendix 2

Summary of the results: Pilots 1 and 2

	Launched by	*Dates*	*Documents*	*Summary / brief descriptions*
Pilot 1	Pilot team	August – December 2011	Internal report	*Appendix 2* and *Section 6.2*
Pilot 2	Pilot team	August – December 2011	Internal report	*Appendix 2* and *Section 6.2*

Details of Pilot 1

Purpose of conducting Pilot 1	Moving the application to the CC KM Maturity level 3
Outcome of Pilot 1	Application has reached CC KM Maturity level 2

Details of Pilot 2

Purpose of conducting Pilot 2	Moving the application to the CC KM Maturity level 4
Outcome of Pilot 2	Application has not reached CC KM Maturity level 3

Appendix 3

Questions for Surveys 1, 2 and 3

Q1: *In which region are you working?* _____

Q2: *What company are you working for?* _____

Q3: *What is your job role in AMU?* _____

Q4: *What is your role in ITSM Knowledge Management (KM)?* _____

Q5: *How often do you share your knowledge?* _____

Q6: *How do you share your knowledge now?* _____

Q7: *What is/are the best source(s) of knowledge for you?* _____

Q8: *On what basis you are using ITSM Knowledge Management?* _____

Q9: *The reason I do use ITSM Knowledge Management on a regular basis is……*

Q10: *The reason I do not use ITSM Knowledge Management on a regular basis is…..*

Q11: *My experience with ITSM Knowledge Management is……..*

Q12: *The reason why my experience with ITSM Knowledge Management is (very) good is…….*

Q13: *The reason why my experience with ITSM Knowledge Management is neutral or (very) bad is……*

Q14: *I believe that the use of ITSM KM/ IT Self Help will bring benefits to the organization.* *Yes / No*

Q15: *I believe that the use of ITSM KM/ IT Self Help will bring benefits to our users (end users and/or key users).* *Yes / No*

Q16: *I believe that the use of ITSM KM/ IT Self Help will bring benefits to me and my colleagues.* *Yes / No*

Q17: *I know who is the Subject Matter Expert and/or Administrator for my application(s).* *Yes / No*

Q18: *Who, in your opinion, is responsible for adding knowledge entries to ITSM Knowledge Management and keep it up to date?* _____

Q19: *The product team for my application(s) is promoting/encouraging the use of ITSM Knowledge Management.* *Yes / No*

Q20: *My Line Manager is promoting/encouraging the use of ITSM Knowledge Management.* *Yes / No*

Q21: *My colleagues are promoting/encouraging the use of ITSM Knowledge Management.* *Yes / No*

Q22: *Company IT Management is promoting/encouraging the use of ITSM Knowledge Management.* *Yes / No*

Q23: *We discuss ITSM Knowledge Management in our team meetings, Production Meetings, meetings with Key Users.* *Yes / No*

Q24: *How competent do you think you are using the ITSM Knowledge Management tool?*
_____

Q25: *How competent do you think you are using the ITSM Knowledge Management process?*
_____

Appendix 4

Questions for Survey 4

Q1: Does application you support have Knowledge Base articles created for? *Yes / No / I do not know what Knowledge Base articles are / Other, elaborate below*

Q2: How often do you use Knowledge Base articles when handling (resolving, providing information etc.) incidents? *Daily/Weekly/Seldom/Never*

Q3: Please elaborate on the reasons why you are not using Knowledge Base articles when handling incidents NOL area/module I support does not have Knowledge Base articles created *I don't know how to use Knowledge Base articles for incidents resolution / It is not possible because of the incidents' type / Current Knowledge Base articles are in such condition that could not be used for the purpose (need modifications) / Other, elaborate below*

Q4: Do you think using Knowledge Base articles when handling incidents would speed incidents' resolution? *Yes / No / Other, elaborate below*

Q5: What in your opinion can facilitate faster incidents resolution? ……

Q6: Does your region currently have a process for Knowledge Base articles to be created? *Yes / No / I don't know / Other, elaborate below*

Q7: Please name Knowledge Management responsible for your region, if you know…….

APPENDIX 5.
GLOSSARY

AMU unit	A department in the case company concerned with monitoring and solving ITSM tickets related to various applications.
Application (Application software)	A computer program which is designed for a specific task or use and has a user interface.
End user(s)	A person(s) within the case company who uses a product, program, application, etc.
Follow-the-sun	A type of global workflow in which tasks are shared between work sites round the clock. The benefits of the model include increasing responsiveness and reducing resolution times of e.g. ITMS tickets.
Incident	Any unplanned interruption to an IT service or a reduction in its quality (ITIL V3 Foundation Handbook: 129).
IT Service Management (ITSM)	A function performed by IT service provider to implement and manage quality IT service(s) which meet the needs of the business.
Key user(s)	A person(s) who has in-depth knowledge of a specific functional domain and the first person to contact for questions regarding this functional domain.
KM Search History Report	A report existing in the case company to identify the search keywords made by Knowledge Base users in order to relate them to relevant articles and possible new once.
KM Utilization Rate	A report existing in the case company to follow on the utilization of Knowledge Articles, i.e. how frequently the articles have been used to resolve ITSM tickets.
KM Volume Growth	A report existing in the case company to follow the growth of Knowledge Articles, i.e. viewed, used for ticket's solution, printed or rated.
Knowledge Article (KA)	A piece of internal information that describes a solution to a problem, answers a question, provides referential information, or describes a process, which is created by support personnel and kept in ITSM Knowledge base.
KM Maturity Model	Five levels model which describes knowledge matureness process.

Pilot	A test, of small scale, implemented to check the conditions and operational details before full scale launch.
Remedy IT Service Management Suite	A full set of IT service management applications by vendor BMC.
Standard Change	A recurrent change that has been proceduralized to follow a pre-defined, relatively risk-free path, and is the accepted response to a specific requirement or set of circumstances, where authority is effectively given in advance of implementation.
Self Help	A web-based self-service interface which enables users to potentially resolve their queries/problems by accessing knowledge base with the intention of eliminating involvement of support personnel which in turn deflect creation of ITSM tickets.
Service Level Requirement (SLR)	A document describing business requirements for an IT service.
Service Level Agreement (SLA)	An agreement between IT Service Provider and a Customer regarding an IT service. It documents Service Level Targets and responsibilities of both parties etc.
Service Level Target	A commitment documented in SLA and based on Service Level Requirements; it is needed to ensure that the IT Service Design meets its Objectives and Service Levels.
Support levels	Types of technical assistance provided by the case company to key users and end users. Companies typically divide their support into levels, e.g. level 1, 2, 3 etc. Typically, level 1 support tries to answer all questions. If the question is more complex, the question is escalated to Level 2. If Level 2 support is unable to help the user, a ticket is directed to the most advanced Level 3.
Level-1	A type of technical assistance provided in the case company that covers general type of inquiries and is provided by the Service Desk and applications' Key Users.
Level-2	A type of technical assistance that is provided by the application support specialists.
Level-3	A type of the most *advanced* technical assistance that is provided by the application support specialists.

Ticket creation	A process which happens when a user has a question/problem or access request related to an application and send it to a support contact point (e.g. Service Desk) for resolving.
Ticket deflection	A process which happens when a user resolves his/her query by him/herself by finding the answer to the query from self-service channel, for which he/she would otherwise have opened an ITSM ticket to a support channel.